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THE PREVENTION OF SILICOSIS BY METALLIC ALUMINUM

II.

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IN a preliminary paper[1] it was shown that the addition of small quantities of metallic aluminum powder almost completely inhibited the solubility of silicious material in the beaker. Six rabbits exposed to quartz dust for six months all showed well developed silicosis. Seven rabbits exposed to quartz dust plus 1 per cent metallic aluminum powder for the same period did not develop silicosis. At that time we were not in a position to state either the manner in which metallic aluminum reduced the solubility of silicious material, or from the animal experiments whether the aluminum was acting locally or systemically, or for what period after the cessation of dusting it would continue to act. This paper reports the further progress of this investigation.

CHEMICAL EXPERIMENTATION

The technical details pertaining to the various substances used in the experiments are given in an appendix.*

The term "solubility" is used to indicate the concentration of silica in the solution under the conditions as noted, determined colorimetrically,[1] and expressed as parts per million (p.p.m.). The term "reduction in solubility" indicates the difference between the solubility of the silica in the presence of the aluminum powder and its solubility in the absence of aluminum powder. It will be noted that the solubility figures for different samples of quartz with no added aluminum vary considerably. The figures do not refer to an equilibrium solubility of silica but to the actual amount of silica dissolved from a given sample in a given time at a given temperature. In view of the fact that quartz dissolves extremely slowly it is evident that the actual figures in any case will depend upon the surface exposed, *i.e.*, fineness of grinding of the different samples.

In an endeavour to determine the mechanism by which metallic aluminum reduces the solubility of silicious materials the following experiments were conducted.

1. *Flocculation.*—It was noted in solubility determinations on aqueous suspensions of silicious materials that the addition of small amounts of metallic aluminum powder produced a flocculation of the particles whereas untreated suspensions remained in the dispersed phase. The effect of positively- and negatively-charged dyes was then determined on the flocculation and solubility of quartz suspensions.

It is shown in Table I that the negative dyes neither produced flocculation nor appreciably reduced the solubility of the quartz. On the other hand the positive dyes did produce flocculation and a fair degree of reduction in solubility.

The effect on the solubility, particle charge, and mobility produced by the addition of increasing amounts of metallic aluminum powder to quartz suspensions was then determined.

It will be noted in Table II that with 0.036 per cent of extremely fine aluminum the solubility has been reduced by 93 per cent, but the flocculation is very slight, whereas it took 0.9 per cent to produce complete flocculation and neutralization of the charge.

* For lack of space this appendix is not printed here. It is on deposit with the American Documentation Institute, Washington, D.C.

TABLE I.
EFFECT OF DYES ON FLOCCULATION AND SOLUBILITY OF QUARTZ SUSPENSIONS

	Solubility SiO_2 p.p.m.	*Per cent Reduction*	*Flocculation*
Quartz suspension (control)	12.4	–	absent
" " + Biebrich scarlet (neg.)	12.6	nil	absent
" " + Eosin (neg.)	10.0	19.0	absent
" " + Methylene blue (pos.)	8.5	31.0	present
" " + Nile blue (pos.)	11.0	11.0	present
" " + Nite blue (pos.)	4.4	64.0	present

1 g. quartz and 5 c.c. of 0.1 per cent solution of each dye was diluted to 50 c.c. with distilled water. Pyrex glass containers, 37° C. continuous agitation 20 hours.

2. *Adsorption of dissolved silica on aluminum.*—Knowing the adsorptive properties of aluminum hydroxides and activated oxides, tests were conducted to determine the rate of removal of silica from "solution" and the quantities of these compounds required as compared to metallic aluminum.

It will readily be observed in Tables IIIa and IIIb that metallic aluminum is much less effective in removing silica from "solution" when compared with the activated oxides and hydroxides over a short period of time. However, when using metallic aluminum in large amounts and over longer periods of time, soluble silica

TABLE II.
EFFECT OF VARIOUS AMOUNTS OF METALLIC ALUMINUM POWDER ON THE SOLUBILITY, PARTICLE CHARGE AND MOBILITY OF QUARTZ SUSPENSIONS

	Mg. Al Added	*Solubility SiO_2 p.p.m.*	*Per cent Reduction*	*Flocculation*	**Charge on Particles*	*†Mobility*
1 g. quartz + 50 c.c. water	0.00	76.0	–	–	neg.	3.0
" + "	0.09	45.0	40.0	±	neg.	2.8
" + "	0.18	26.0	66.0	±	neg.	2.6
" + "	0.36	5.1	93.0	+	neg.	3.0
" + "	0.91	4.4	94.0	++	neg.	3.1
" + "	1.81	2.2	97.0	+++	neg.	3.7
" + "	2.72	1.7	98.0	++++	neg.	2.6
" + "	4.52	0.9	99.0	++++	neg.	3.2
" + "	7.24	0.9	99.0	almost complete	very small neg.?	0.0
" + "	9.06	0.9	99.0	complete	nil.	0.0

Bakelite containers, continuous agitation 20 hours. 37° C.
* Cataphoretic observations conducted in an Abramson cell.
† Mobility units – cm. per second and per volt per cm.

We acknowledge our thanks to Mr. Newman, of the Department of Physics, University of Toronto, for conducting the experiments on the particle charge and mobility.

TABLES IIIa. AND IIIb.
EFFECT OF ALUMINUM POWDER, ACTIVATED ALUMINUM OXIDE AND ALUMINUM HYDROXIDE ON SODIUM SILICATE AND SOLUBLE QUARTZ SOLUTIONS

TABLE IIIa.

	Original Concentration SiO_2 p.p.m.	*Final Concentration SiO_2 p.p.m*	*SiO_2 p.p.m. Removed from Solution*
Sodium silicate solution pH 7.5 (control)	20.7	20.4	–
50 c.c. + 30 mg. Al_2O_3 (S-242-5)	20.7	1.2	19.5
50 c.c. + 30 mg. Al_2O_3 (S-242-5)	20.7	2.1	18.6
50 c.c. + 10 mg. Al(ii)	20.7	20.8	nil
50 c.c. + 10 mg. Al(ii)	20.7	20.5	nil

TABLE IIIb.

Quartz filtrate pH 7.5 (control)	89.2	90.3	–
25 c.c. + 7.2 mg. $Al(OH)_3$ (780A)	89.2	76.3	12.9
25 c.c. + 7.2 mg. $Al(OH)_3$ (771-1)	89.2	76.3	12.9
25 c.c. + 4.7 mg. Al_2O_3 (S-242-5)	89.2	71.9	17.3
25 c.c. + 2.5 mg. Al (X-422)	89.2	82.7	6.5

Bakelite tubes 37° C., 20 hours continuous agitation.
Quartz filtrate dialyzed through cellophane.

can be removed to a greater extent, as shown in Chart 1. This is in all probability due to the continuous production of more hydroxide over a longer period.

3. *Adsorption of aluminum on the silicious particle.*—The above experiments did not account for the prompt large reduction in solubility produced by the addition of small amounts of metallic aluminum to silicious materials. It was then assumed that the reverse process might take place, that is, the reduction in solubility might be due to a film of an insoluble aluminum compound being adsorbed on the surface of the silicious particles. The following experiments were conducted to test this assumption.

of 1 per cent metallic aluminum powder, was determined at hydrogen ion concentrations of pH 4 to pH 12. Some of these results are shown in Charts 2, 3 and 4. It will be seen that the addition of aluminum powder inhibits the solubility of silica in the various minerals through the hydrogen ion concentration range pH 6 to pH 11. Above pH 11 and below pH 6 the inhibition appears to be ineffective. This strongly indicates the presence of an insoluble aluminum compound on the surface of the quartz particles, preventing their solution within this pH range.

To demonstrate that the adsorbed hydrated alumina coating, in preventing the solution of silica, depends on the amount present and the surface to be coated solubility tests were conducted on silica smoke (–20 Angström units) and McIntyre quartz (–5μ), with and without the addition of varying amounts of metallic aluminum powder (Chart 5). It is definitely shown in Chart 5, that the amount of aluminum required to reduce the solubility of silica suspensions is dependent on the total surface of the silica particles.

TABLE IV.

EFFECT OF THE ADDITION OF SMALL AMOUNTS OF METALLIC ALUMINUM TO QUARTZ SUSPENSIONS AT VARIOUS TIME INTERVALS

Tube No.	*Time of Addition of Aluminum (in minutes)*	*SiO_2 p.p.m. When Aluminum added*	*SiO_2 p.p.m at 30 hours*
1	60	3.3	2.6
2	120	5.8	4.8
3	180	5.5	5.0
4	300	10.8	9.6
5	360	15.4	13.1
6	415	14.3	11.6
7	control	–	31.2

1 g. quartz powder, 100 c.c. distilled water used in each test.
25 c.c. quartz suspension removed during agitation for silica determination at stated time intervals; then 1.8 mg. aluminum added.
Bakelite containers 37° C. Continuous agitation.

Table IV shows clearly that the addition of small amounts of aluminum powder stops further "solution" when added at various time intervals, without appreciably removing the dissolved silica from solution. This experiment tended to confirm the theory of adsorption. It was then assumed that the film adsorbed on the quartz particle might be a hydrated aluminum oxide. On this assumption, the solubility of various silicious powders, with and without the addition

TABLE V.

SOLUBILITY OF QUARTZ IN LOCKE'S SOLUTION WITH AND WITHOUT ALUMINUM POWDER OVER LONG PERIODS OF TIME

Days	*Quartz Control SiO_2 p.p.m.*	*Quartz + 1 p.c. Aluminum SiO_2 p.p.m.*	*per cent Reduction*	*Quartz + 2 p.c. Aluminum SiO_2 p.p.m*	*per cent Reduction*	*Quartz + 3 p.c. Aluminum SiO_2 p.p.m*	*per cent Reduction*
34	63.7	0.7	99.0	0.5	99.0	0.5	99.0
68	67.5	1.4	98.0	1.4	98.0	1.4	98.0
94	75.6	0.3	99.0	0.3	99.0	0.3	99.0
133	60.7	0.3	99.0	0.3	99.0	0.3	99.0
320	81.3	0.3	99.0	2.8	97.0	2.8	97.0
385	99.5	0.3	99.0	3.9	96.0	3.3	97.0

5 g. quartz powder, 500 c.c. distilled water, with the addition of 1, 2, and 3 per cent aluminum were placed in rubber stoppered pyrex flasks and allowed to stand at room temperature with occasional agitation.

CHART 1.

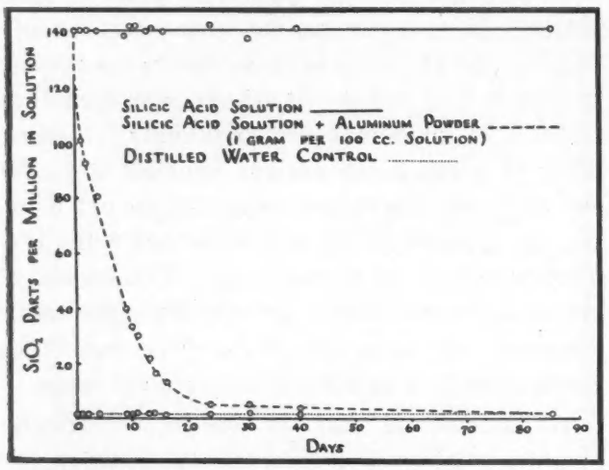

SiO2 Parts per Million in Solution
Silicic Acid Solution
Silicic Acid Solution + Aluminum Powder
(1 gram per 100 cc. Solution)
Distilled Water Control
Days

Chart 1 shows the effect of large amounts of aluminum powder on a solution of silicic acid. Waxed glass containers; room temperature 20° C.; occasional agitation.

The permanency of this adsorbed film on quartz particles was tested in water and physiological solutions (Locke's) for a period of thirteen months. The results obtained in Locke's solution are shown in Table V and are similar to those obtained in water.

In a further experiment a mixture of quartz to which 1 per cent metallic aluminum had been added was placed in Locke's solution. This solution was changed daily for a period of three months. At the conclusion of the experiment there was no increase in the solubility of the quartz.

4. *Staining of the adsorbed film.*—To determine the nature of the adsorbed film samples from the above tests (Table V) taken at various periods, were treated with aurine dye (aurinetricarboxylic acid) which gives a characteristic cherry red colour with aluminum hydroxide. It was difficult to be sure of the dyed film on such small particles under the microscope, so larger pieces of quartz from ¼ to 8 inch slabs were then treated with metallic aluminum and water for varying periods of time (4 to 38 days), taken out, washed and scrubbed with a brush, and placed in a 2 per cent aqueous solution of aurine, buffered at pH 5.2, heated to 70° C. for five minutes, removed and washed. These pieces stained a cherry red colour, whereas quartz not treated with aluminum and subjected to the dye treatment failed to show any coloration (Fig. 1). Different types of activated oxides and hydroxides of aluminum were used in similar tests, and it was found that the intensity in colour of the dyed surface corresponded closely

CHART 2.

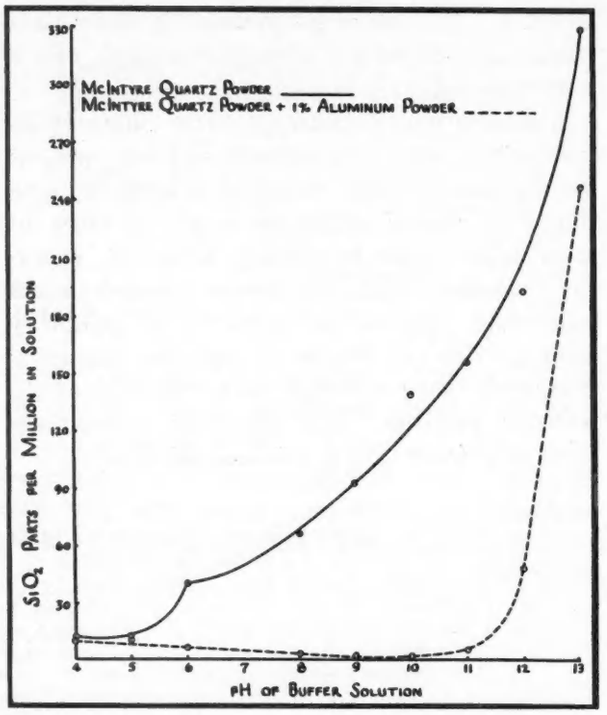

McIntyre Quartz Powder
McIntyre Quartz Powder + 1% Aluminum Powder
SiO2 Parts per Million in Solution
pH of Buffer Solution

CHART 3.

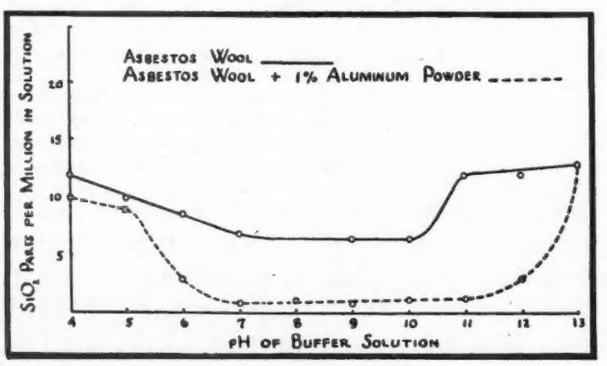
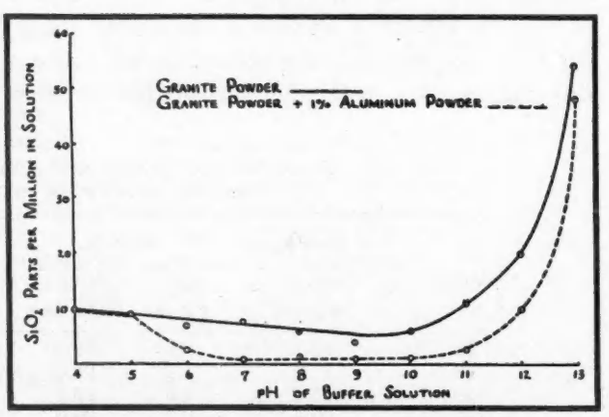


CHART 4.



Charts 2, 3, and 4 show solubility of various silicious powders with and without metallic aluminum powder at various hydrogen ion concentrations. One gram powder and 50 c.c. buffer solution used in each test. Temperature 37° C.; continuous agitation, 20 hours; bakelite containers.

to the effect of these compounds in reducing the solubility of quartz (Table VI).

It was found that the stainable film on the surface of aluminum-treated quartz when subjected to solutions more acid than a pH of 4 or more alkaline than a pH of 12 completely disappeared. These samples, when taken from the solution and washed thoroughly, could not be stained with aurine unless again subjected to the aluminum treatment.

CHART 5.

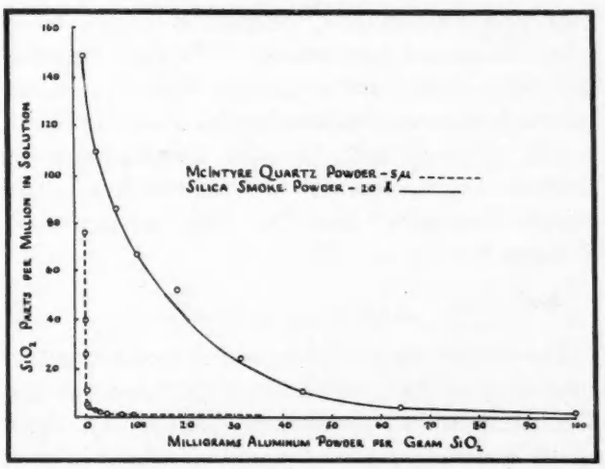

McINTYRE QUARTZ POWDER - 5 Mi
SILICA SMOKE POWDER - 10 A
SiO2 PARTS PER MILLION IN SOLUTION
MILLIGRAMS ALUMINUM POWDER PER GRAM SiO2

Chart 5.—The amount of aluminum necessary to reduce the solubility of silica in relation to particle size. One gram powder + 50 c.c. water used in each test; pyrex glass containers; 37° C., 20 hours' continuous agitation.

5. *Identification of the adsorbed film by the electron diffraction pattern.* — Dr. Lester H. Germer and Mr. K. H. Storks, of the Bell Telephone Laboratories, New York City, have very kindly made a preliminary study of the material which is precipitated upon silica by the reaction of water and aluminum. They have identified this material as a hydrated oxide of aluminum. By a spectroscopic examination of the film scraped from a quartz surface they showed that its silica content was less than 0.5 per cent of its alumina content. After drying the film electron diffraction patterns characteristic of the crystalline alpha aluminum monohydrate ($Al_2O_3.H_2O$) were obtained. The drying was necessary because electron diffraction patterns must be taken *in vacuo*. Since experiments show that the crystalline alpha monohydrate does not stain deeply enough with the aurine dye to account for the observed colour, while the precipitated gelatinous hydrated oxide is deeply stained, it appears probable that the film on the quartz is a gelatinous hydrated oxide of aluminum which is converted into the crystalline monohydrate on drying.*

Following this work tests were made to determine the effect of aluminum mono and trihydrate on the solubility of quartz as compared to metallic aluminum and activated alumina.

TABLE VI.

EFFECT OF ALUMINUM MONO AND TRIHYDRATE ON THE SOLUBILITY OF QUARTZ

	Solution SiO_2 p.p.m	*Per cent Reduction*
Quartz control	133	–
Quartz + 10 mg. Al(ii)	4	97.0
Quartz + 30 mg. corundum	131	–
Quartz + 30 mg. activated amorphous alumina (S-242-5)	15	89.0
Quartz + 30 mg. alpha monohydrate (1420 W)	131	–
Quartz + 30 mg. alpha trihydrate (1413)	132	–

1 g. quartz—50 c.c. water. Bakelite tubes. Continuous agitation 23 hours. 37° C.

This experiment shows clearly that the mono and trihydrate of aluminum have no effect in preventing the solution of the quartz particle; whereas the activated amorphous alumina inhibited the solution by 89 per cent but was not as effective as the metallic powder.

CHEMICAL DISCUSSION

Gardner[2] has brought forth experimental evidence which strongly suggests that the toxicity of silica is due to that portion of the silica which is in the dispersed colloidal form. Whether or not this theory is correct our experiments seem to show that what we have defined and determined as "solubility" is a measure of the toxicity of the *quartz* particle. We have demonstrated that the adsorbed film of hydrated aluminum oxide is sufficiently impermeable to prevent silica from passing into what we have defined as "solution", *i.e.*, the state in which it will form silico-molybdic acid.

Flocculation.—It has been observed by other workers that aqueous suspensions of quartz powders are flocculated by many substances. Positively charged dyes, the hydroxides of nickel, iron and tin, as well as minerals such as gypsum, and the mineral mixtures present in certain country rocks and shales, all flocculate quartz suspensions. It has been shown (Table

* Dr. Germer and Mr. Storks are continuing their work, and we understand that they will publish a description of it elsewhere when it is completed. In the meantime, this preliminary statement of their results is made with their approval. The alpha monohydrate is the one often called "Boehmite" in the German literature.

I) that flocculation may be present with very little reduction in "solubility" and (Table II) that a marked reduction in "solubility" can take place with slight flocculation only. The immediate and permanent reduction in the "solubility" of quartz by metallic aluminum can be accounted for only to a slight extent by flocculation brought about by the neutralization of the charge on the quartz particles.

Adsorption of dissolved silica on aluminum.—Metallic aluminum in small quantities over a short period of time has been shown to be only slightly effective in removing silica from "solution", while some of the oxides and hydroxides were more efficient. There was found to be a great variation in the adsorptive properties of various types of these compounds, depending on their method of preparation. While larger quantities of the metal did remove silica from "solution", this was undoubtedly due to the production of more hydroxide over a long period of time. This time factor alone shows that the rapid reduction in "solubility" of the silicious particles by small amounts of metal cannot be due to the *removal* of silica from "solution". This is also corroborated by Table IV, where the addition of small amounts of aluminum to quartz suspensions *immediately prevents* further solution without appreciably diminishing the silica in solution.

Adsorption of aluminum hydroxide on the silicious particle.—The prevention of further "solution" of quartz suspensions, produced by the addition of small amounts of metallic aluminum powder, suggested that the negative charge on the quartz particles was being satisfied by an adsorbed film of positively charged hydrated alumina. The neutralization of the charge on the suspended quartz particles resulted in their flocculation and the adsorbed film of hydrated alumina prevented further "solution" of the quartz particles. It is known that aluminum hydroxide is almost completely insoluble within the range pH 5.5 to 8.4, forming a soluble salt when the solution is more acid than pH 4 and a soluble aluminate when it is more alkaline than pH 12. The solubility curves at various hydrogen ion concentrations of quartz and silicates (Charts 2, 3 and 4) with and without aluminum powder, strongly suggest that removal of the adsorbed film, allowing the rapid solution of the silicious particles, takes place at hydrogen-ion concentrations corresponding to those at which aluminum hydroxide is soluble.

The cherry-red staining with aurine on the surface of quartz after immersion in aqueous suspensions of aluminum and the gelatinous forms of its hydroxides, again strongly suggest the presence of an adsorbed film of gelatinous hydrated alumina. In all cases the aurine-stained film on quartz after treatment with aluminum powder at room temperature has been much more pronounced than that produced by activated oxides and hydroxides including those that produced marked reductions in the solubility of quartz suspensions. The fact that the film, demonstrable by aurine staining, is removed by immersion in solutions above or below a pH range of 4 to 12, and cannot again be stained unless treated with aluminum, adds further evidence that the film is hydrated alumina.*

ANTIDOTAL ROCKS

The modifying influence which shale, country rock and certain silicates seem to exert on the production of fibrosis caused by free silica is occupying an important place in the investigations of many prominent research workers — King,[3, 4] Brisco,[5] Whitehouse[6] and others. Haldane[7] believed that these antidotal rocks moderated the action of silica in two ways—by dilution and by some form of antagonism. It is of interest in this connection to point out that in the mines of the Porcupine district of Ontario the men working in the crusher houses of the mills do not develop silicosis, although there is approximately 35 per cent of free silica in the mill feed. In a previous paper[8] it was pointed out that animals exposed to this dust, although having large amounts of dust in their lungs, failed to show any fibrosis up to a period of twelve months.

The authors have conducted an investigation into mill feed, country rock and slate obtained in the Porcupine camp, and although this investigation is far from complete they have found that these three materials, having low silica solubilities themselves, when added in 50-50 proportions to quartz will reduce the solubility by 70 to 80 per cent. It was further found that when these mixtures were treated with alkaline

* Through the kindness of Dr. Germer and Mr. Storks, whose tentative findings have been pointed out above, this adsorbed film can now be definitely identified as a form of hydrated alumina.

solutions above pH 12 the antidotal materials had lost their ability to further retard the "solution" of quartz, and aluminum hydroxide was found to be present in the solution. We wish to point out the similarity of the reaction when aluminum-coated quartz is treated in an alkaline solution above pH 12 (Chart 2).

Analysis of these rocks showed them to contain from 10 to 20 per cent of alumina, present chiefly as silicates. The authors believe that the modifying action of antidotal rocks is due in part to the aluminum present, to a slight extent, as free hydroxides derived from the breaking down of these silicates—perhaps connected with the weathering of pyrite or other sulphides present. In the lung these weathered silicates, if present in large amounts, may have the same effect on the silica as they did in the beaker. Gardner[2] has demonstrated that the hydrated oxides of iron when added to quartz, have a definite retarding effect on cellular reaction. We believe that some antidotal rocks may contain considerable quantities of iron, the hydrated oxides of which, by taking silica out of solution, may also be playing a part in the antidotal mechanism.

From the experiments recorded in this paper, those in a previous communication, and from experiments that space does not permit recording here, it has been shown definitely that metallic aluminum prevents "solution" of quartz and silicious materials in three ways: to some extent either by flocculation, or the removal of silica from "solution" by adsorption, but chiefly by coating the mineral particles with gelatinous hydrated alumina that almost entirely prevents their solution. The solution-preventing action of the gelatinous layer of hydrated aluminum seems to be responsible for the powerful effect of the small amounts of metallic aluminum required to inactivate quartz particles, as compared to the large amounts of other protective agents required, such as gypsum, iron oxides, etc.

ANIMAL EXPERIMENTATION

The animal experiments consisting of three main groups were carried out to determine (1) whether the inactivation of quartz by aluminum was a local or systemic reaction; (2) the tissue reaction produced by the injection of quartz powder, the solubility of which, prior to injection, had been progressively depressed by the addition of increasing amounts of aluminum; (3) the reaction produced in the lungs by the retention of inhaled aluminum dust, quartz dust and mixtures of quartz and aluminum dusts, when breathed in varying proportions either separately or as admixtures. During the course of the different experiments numbers of the rabbits died from infections. Those animals were discarded in which the infective process in any way obscured the reaction produced by the presence of dust and are not included in the data recorded below.

1. *Local or systemic reaction.*—To ascertain whether aluminum powder was acting locally or systemically in preventing fibrosis the following experiments were conducted. (*a*) Rabbits were fed metallic aluminum powder in their rations, 10 mg. each, daily, and dusted for twelve hours with quartz dust. (*b*) Rabbits were injected subcutaneously, intramuscularly, intraperitoneally, and intravenously, with varying amounts of metallic aluminum powder at various intervals while being subjected to quartz dust, twelve hours daily. (*c*) Subcutaneous injections of 10 mg. of -5μ quartz were made into the backs of a series of rabbits, and they were then exposed to aluminum dust twelve hours daily. (*d*) To another series of rabbits injected subcutaneously with quartz only, weekly intravenous injections of varying concentrations of metallic aluminum powder were given.

Animals from these groups were killed at various intervals, and sections for microscopic examination prepared from lungs, liver, spleen, kidney and the areas injected with quartz. Microscopically there was no evidence found to indicate that aluminum was acting systemically. Animals in groups *a* and *b* developed fibrosis to the same extent and at the same rate as control animals dusted with quartz only. In groups *c* and *d* fibrotic nodules developed at the same rate and were of the same character and degree as the controls.

2. *Amount of aluminum necessary to inactivate quartz in tissue.*—The relation between the solubility of quartz in water, the amount of metallic aluminum needed to inactivate quartz, the tissue response, and the stability of the hydrated alumina coating on the quartz particles was determined by the following experiments.

Samples of -5μ quartz were prepared by grinding quartz on quartz and separating by air-sedimentation. To these samples varying amounts of metallic aluminum powder were

PLATE I.

PHOTOGRAPHS REPRODUCED IN NATURAL COLOURS FROM KODACHROME FILMS.

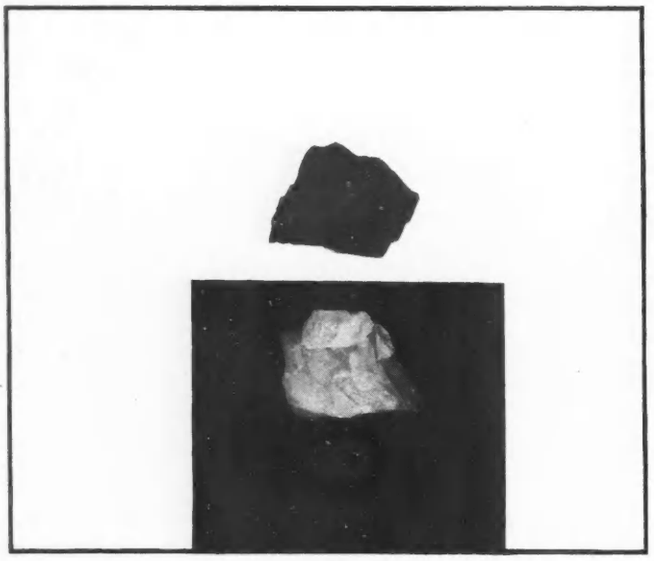


Fig. 1

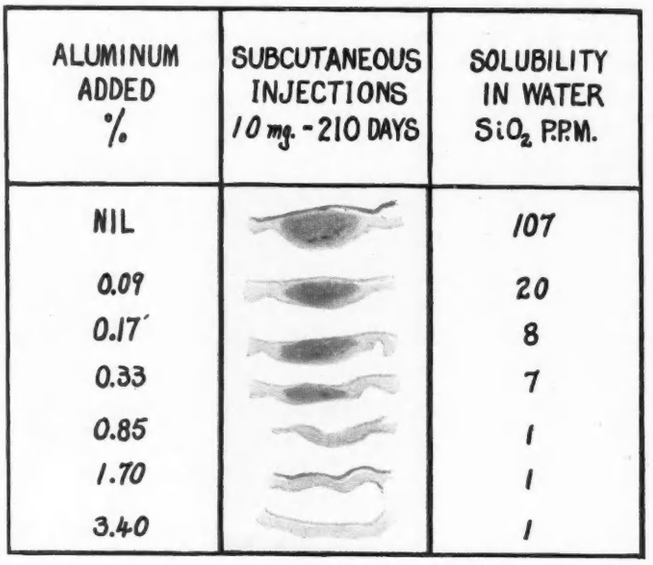


Fig. 2

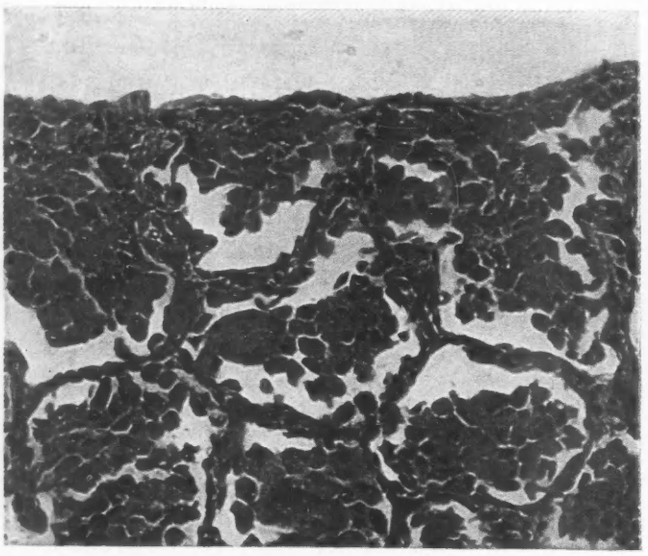


Fig. 3

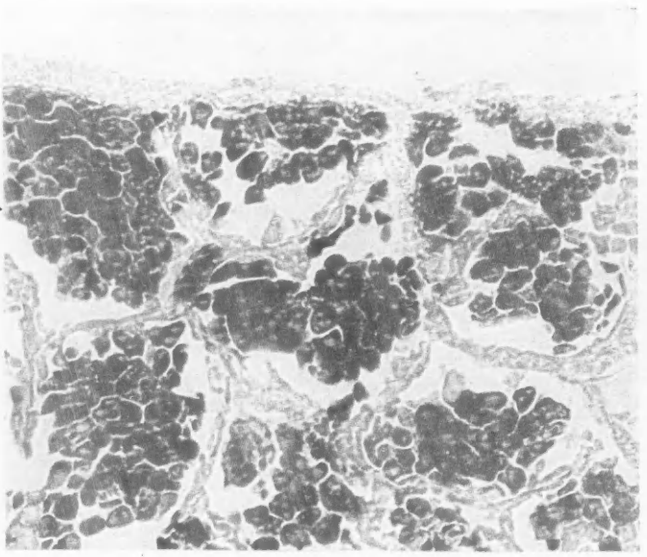


Fig. 4

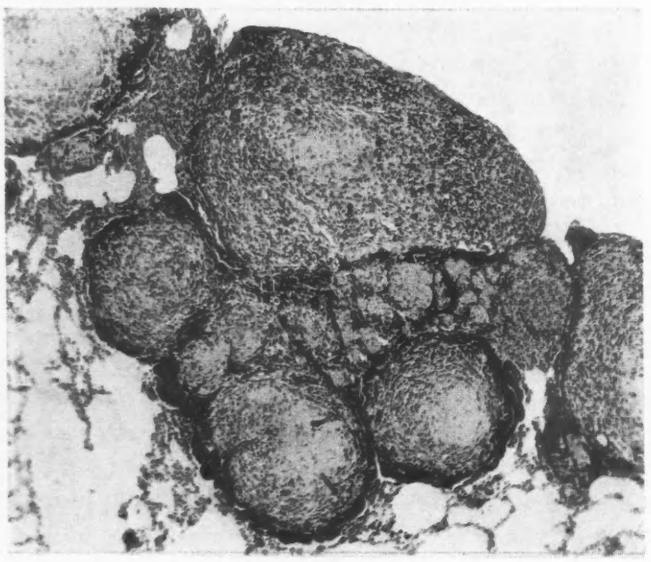


Fig. 5

Fig. 6

Fig. 1.—Upper quartz coated with hydrated alumina, then subjected to aurine dye treatment (red stained). Lower quartz uncoated but subjected to the same dye treatment (not stainable). **Fig. 2.**—This series of quartz injections was made into the back of the same animal. **Figs. 3, 5, 7, 9, 11.**—Stained with routine hæmatoxylin and eosin. **Figs. 4, 6, 8, 10, 12.**—Stained with aurine to demonstrate presence of red staining hydrated alumina. **Figs. 3 and 4.**—Typical foreign-body response produced by aluminum dust. **Figs. 5 and 6.**—Typical nodular fibrosis produced by quartz dust. Note absence of any hydrated alumina.

PLATE II.

PHOTOGRAPHS REPRODUCED IN NATURAL COLOURS FROM KODACHROME FILMS.

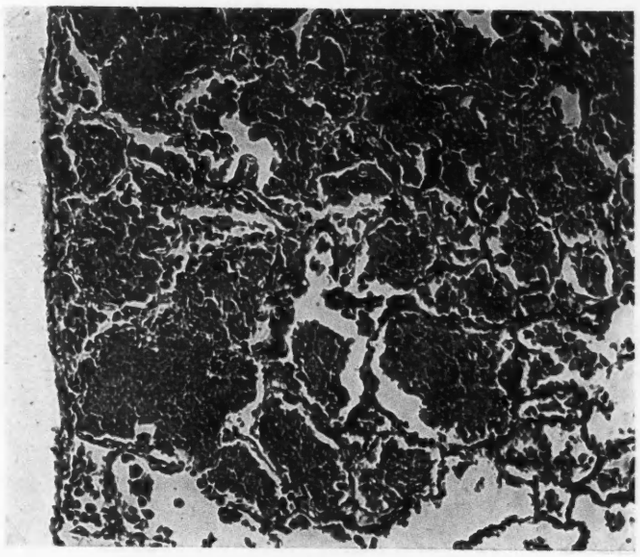


Fig. 7

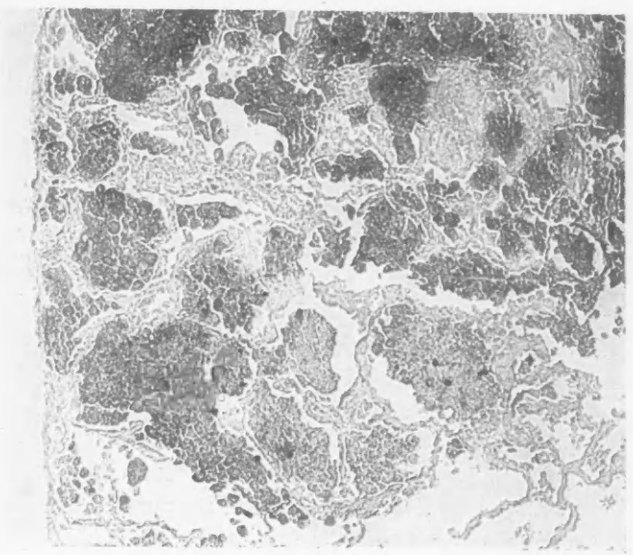


Fig. 8

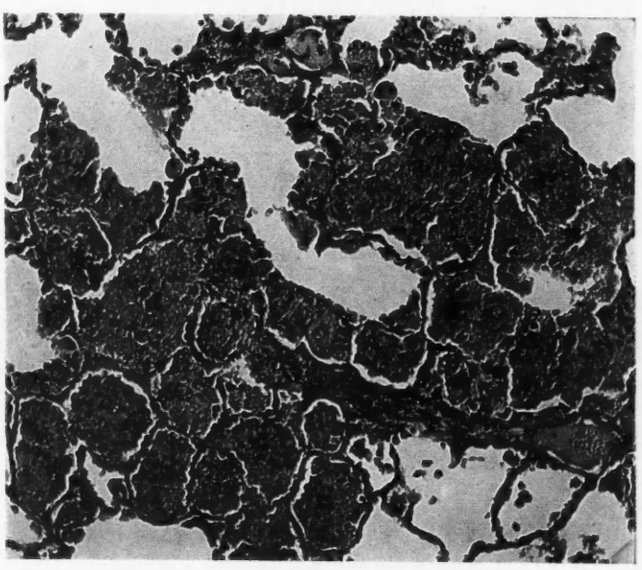


Fig. 9

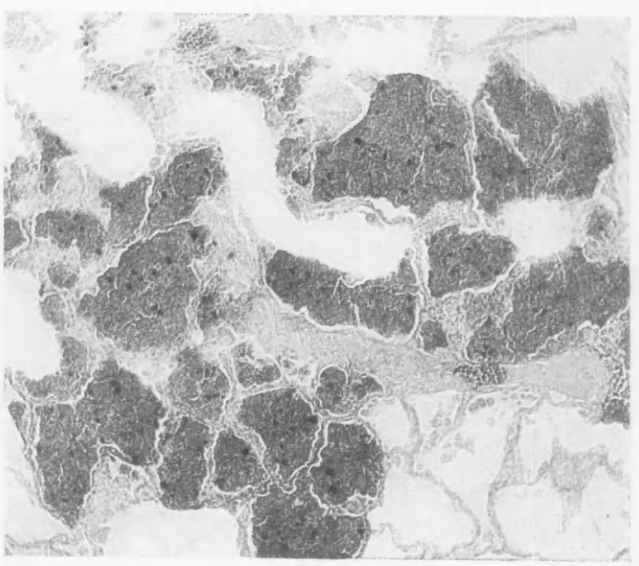


Fig. 10

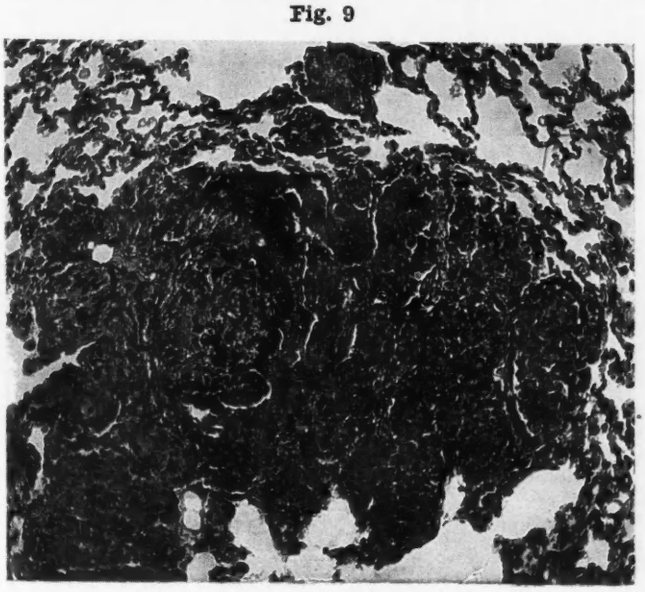


Fig. 11

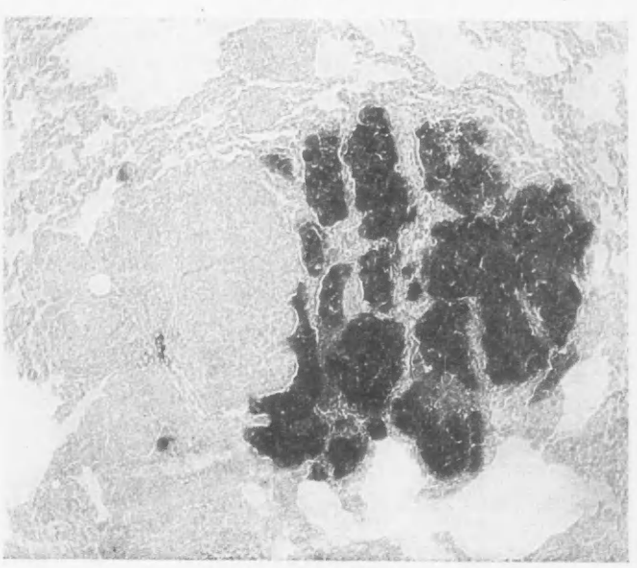


Fig. 12

Figs. 7 and 8.—Typical foreign-body response produced by admixture of quartz and aluminum. **Figs. 9 and 10.**—Typical foreign-body response produced by daily dusting with aluminum for 40 minutes before or after the 12 hours quartz dusting. **Figs. 11 and 12.**—Silicotic rabbit subsequently dusted with aluminum 20 minutes daily. Note presence of alumina in quartz containing dust cells showing foreign-body reaction and absence of alumina in areas of early fibrosis.

added and the solubility of the mixtures determined in water after twenty hours' agitation. Ten mg. amounts of all these samples were then injected into each of several rabbits, and cross-sections of the injected areas examined microscopically at two and seven months. At two months the sections of the injected areas showed nodular fibrosis with metallic aluminum concentrations up to 0.33 per cent and a foreign-body reaction with 0.85 per cent or greater. At seven months this picture was unchanged (Fig. 2).

3. *Dusting experiments.* — The methods of dusting and the apparatus used in repeating the original experiments at the McIntyre mine were the same as described in our first paper.[1] In the experiments conducted at the Department of Medical Research, however, tube mills, lined with rubber, were used instead of quartz lined tumble boxes, as tests had shown practically no wear on this special rubber liner and contamination of the quartz dust was negligible. The mills were easy to install and required a minimum amount of attention. The cages were designed to house 12 rabbits each, and were arranged in groups to take care of various types of dusting. Each cage was connected to a negative pressure ventilating system and care taken to avoid dust contamination from group to group. At weekly intervals the ventilating system was checked with an anemometer, dust counts estimated by the Franks photo-electric machine,[9] and particle size determined. The total SiO_2 and total aluminum content as well as the solubility of the dust in the various cages were also determined.

All dusted animals, the findings on which are recorded below, except the aluminum controls, were exposed for varying periods of time to different concentrations, as noted, of quartz and/or aluminum dust of approximately 20,000 particles per c.c., the majority being under 3 microns in diameter. At various intervals animals were killed to determine the amount of dust in the lungs and the type of tissue response. Portions of all lungs were assayed chemically to determine the amount of quartz and aluminum present. The aluminum assays have been expressed as milligrams of the metal per 100 g. of the dried tissue. The microscopic sections were prepared in the same manner as stated in our first paper.

Aluminum control animals.—Rabbits were exposed to aluminum dust to determine the effect of inhaled aluminum in the lung and on the general health of the animals over long periods of time. Eight rabbits were exposed to an atmosphere containing freshly ground finely particulate aluminum powder in a concentration averaging 7,000 particles per c.c., 12 hours daily for 14 months. Following cessation of the dust exposure some of the animals were observed for an additional seven months. Chemical assay of the lungs showed them to contain from 270 to 1,200 mg. of aluminum per 100 g. of dried tissue. During their life-time these animals gained normally in weight, and from the appearance and texture of the fur and their general behaviour there was no evidence of any harmful effect due to the inhalation of the aluminum dust.

The gross and microscopic examination of the tissues apart from the lungs showed them to be normal. In the gross the lungs showed a uniform dark mottling of the pleural surfaces and on sectioning this was seen to be distributed uniformly throughout. Apart from this the lungs appeared normal. Microscopic examination showed the mottled areas, seen in the gross, to be aggregates of dust cells almost completely filling adjacent alveolar spaces. These cells contained irregular shaped opaque particles, the majority being under 3μ in diameter. Practically all these particles were present in the dust cells. These cells presented regular outlines and their nuclei stained well. The alveolar walls throughout the lung showed no evidence of thickening except occasionally in the dust-containing areas. This thickening consisted of a slight alveolar endothelial proliferation. The ciliated epithelial lining of the bronchial tree appeared normal. The lymphatic spaces and aggregates throughout the lung contained relatively few dust-laden cells, and showed no evidence of thickening or damage. The opaque particles seen in the dust cells were observed to give off bubbles and completely disappear when a drop of 6N NaOH was placed on a section under a cover slip. Sections stained with aurine showed the cytoplasm of these dust cells to contain varying concentrations of a cherry red colour (Figs. 3 and 4).

Quartz controls.—All the control animals used for the various experiments were housed in a separate group of cages and received quartz dust for twelve hours daily. As recorded in Table VII practically all these animals from five months on showed the nodulations typical of

TABLE VII.

QUARTZ DUSTING ONLY—12 HOURS DAILY

Rabbit number	Period of dusting (days)	Removal from dust (days)	Lung assay: *Mg. per cent Al / Mg. per cent SiO_2 × 100 = Percentage	Fibrosis present in: Peribronchial lymphatics	Perivascular lymphatics	Alveoli	Alveolar wall thickening non-fibrotic
209	105	0	2.8/585 0.5	-	-	-	-
165	105	0	22/5500 0.4	+	-	-	-
C	120	0	16/1200 1.3	+	-	-	-
466	120	0	1.8/340 0.5	-	-	-	+
513	123	0	3.9/3200 0.1	-	-	-	-
377	128	0	.2/185 0.1	-	-	-	-
461	129	0	4.1/810 0.5	-	-	-	-
375	134	0	1/234 0.4	-	-	-	-
580	138	0	1.8/660 0.3	-	-	-	+
214	138	0	6.6/1420 0.5	+	-	-	-
206	138	0	6/810 0.7	+	-	-	-
90	151	0	4.5/1010 0.4	-	-	-	-
89	161	0	3.6/540 0.7	+	-	-	-
788	163	131	17/3980 0.4	+	-	-	+
779	163	188	23/4510 0.5	+	-	-	+
510	167	0	10.9/5906 0.2	+	+	-	-
70	172	0	4.4/487 0.9	-	-	-	+
562	173	0	5.8/5450 0.1	-	-	-	+
581	175	0	3.7/1150 0.3	+	-	-	++
756	177	0	2.5/2720 0.1	+	-	-	-
4C	178	0	4.5/550 0.8	+	-	-	-
151	180	0	12/6550 0.2	++	++	+	+
104	180	0	1.3/4280 0.0	++++	++++	++++	++
774	180	0	10/3900 0.2	-	++	+	++
770	183	0	33/5720 0.6	-	-	-	+
508	193	0	4.5/3400 0.1	-	-	-	+
1C	201	0	8.4/4320 0.2	++	++	++	+
166	215	0	28/8740 0.3	+++	+++	++	+
222	219	0	5.4/885 0.6	-	-	-	-
344	230	0	5.4/1570 0.3	-	-	-	-
764	233	13	11.6/7370 0.1	+	+	+	+++
753	233	25	13/4650 0.3	+	+	-	+
751	233	55	25/7140 0.3	+	+	+	+
771	233	102	42/6700 0.6	+	++	+	++
761	233	207	23/5130 0.4	++	++	++	++
62	252	0	2.9/965 0.3	+	+	-	+
336	294	0	3.9/3900 0.1	+	+	-	+
156	300	0	20/5710 0.3	++	+	-	+
152	300	0	3.2/1020 0.3	++	+	+	+
153	300	0	13/2850 0.4	++	++	++	++
343	301	0	3.5/930 0.1	+	-	-	-
239	303	0	1.8/950 0.2	+	-	-	-
583	324	39	9.1/2360 0.3	++	++	++	++
227	335	0	23/10800 0.2	+	+	++	+
236	343	0	14/3240 0.4	+	-	-	-
527	345	135	11/9700 0.1	++	++	++	++
506	345	137	7/1470 0.5	++	++	++	++
205	364	0	113/9430 1.2	+	+	-	+
339	370	0	12/1990 0.6	+	-	+	++
488	378	131	11/2460 0.4	++	++	+	+++
479	380	210	20/6200 0.3	+++	+++	++++	++
215	388	20	23/4650 0.5	++	++	+	++
212	388	210	5/630 0.8	++	++	+	++
208	388	210	16/2860 0.5	++	++	++	++
398	398	210	14/4210 0.3	++	++	++	+++
84	412	210	24/4740 0.5	++	++	+++	++
232	415	39	3.4/2090 0.2	++	++	++	++
230	415	210	5.4/2000 0.3	++	++	++	++
91	590	0	6.4/6500 0.1	++	++	++	+

*This equation actually represents the ratio of quartz to aluminum and not the true percentage. Due to the fact that they are practically the same and we have used percentage throughout the paper we have used this term in order not to confuse the reader.

\+ =slight amount of fibrosis.
++ =moderate " " "
+++ =marked " " "
++++ =massive " " "

TABLE VIII.

ADMIXTURE OF QUARTZ AND ALUMINUM DUSTS—12 HOURS DAILY

Rabbit number	Period of dusting (days)	Removal from dust (days)	Lung assay: *Mg. per cent Al / Mg. per cent SiO_2 × 100 = Percentage		Fibrosis present in: Peribronchial lymphatics	Fibrosis present in: Perivascular lymphatics	Fibrosis present in: Alveoli	Alveolar wall thickening non-fibrotic
			ALUMINUM PERCENTAGE—0.5					
137	118	0	2.3/607	0.4	–	–	–	–
175	118	0	2.7/1000	0.3	–	–	–	–
313	163	0	2.4/695	0.3	–	–	–	+
312	163	45	2.4/1170	0.2	–	–	–	+
104	174	0	6.4/1780	0.4	–	–	–	–
355	174	0	3.7/2540	0.1	–	–	–	+
428	232	0	3.4/1490	0.2	–	–	–	+
539	282	0	4.6/1380	0.3	–	–	–	+
429	301	0	2.8/665	0.4	–	–	–	+
423	324	0	8.8/4030	0.2	–	–	–	+
567	325	210	19/4610	0.4	+	+	–	++
489	383	195	5.2/1850	0.3	+	+	+	++
474	389	165	6.7/2670	0.2	+	+	+	++
473	389	202	0.9/2440	0.0	+	+	+	++
378	390	150	21/4980	0.4	+	+	+	++
396	403	210	39/8500	0.4	+	+	+	++
317	413	157	32/6930	0.5	–	–	–	++
105	431	135	21/4280	0.5	+	+	+	++
150	431	210	26/6130	0.4	+	+	+	++
			ALUMINUM PERCENTAGE 0.5 TO –1.0					
435	382	0	31/3890	0.8	–	–	–	+
422	398	120	16/2840	0.5	–	–	–	–
330	403	210	51/5670	0.9	–	–	–	++
160	404	0	61/8500	0.7	–	–	–	+++
128	431	30	58/7750	0.7	–	–	–	++
147	431	210	5.2/825	0.6	+	+	+	++
148	431	210	16/3100	0.5	+	+	–	++
111	431	37	32/4200	0.7	+	+	+	++
362	431	210	27/5030	0.5	–	–	–	++
			ALUMINUM PERCENTAGE 1.0 TO –1.5					
499	149	0	52/3800	1.4	–	–	–	–
363	237	0	17/1240	1.4	–	–	–	–
384	262	0	33/2540	1.3	–	–	–	+
132	342	0	50/4850	1.0	–	–	–	+
392	389	0	49/4550	1.1	–	–	–	++
365	398	0	49/4360	1.1	–	–	–	+
292	403	210	88/7200	1.2	–	–	+	+
359	431	67	87/6250	1.4	–	–	–	++
183	431	97	68/5280	1.3	–	–	+	+
189	431	135	110/10200	1.1	+	+	+	++
			ALUMINUM PERCENTAGE 1.5 TO –2.0					
459	142	0	3.7/242	1.5	–	–	–	–
177	174	0	72/3690	1.9	–	–	–	+
490	179	0	34/2180	1.6	–	–	–	–
188	223	0	16/1000	1.6	–	–	–	–
540	271	0	24/1550	1.5	–	–	–	++
131	418	0	119/6420	1.9	–	–	–	++
185	431	97	170/9750	1.7	–	–	–	+
			ALUMINUM PERCENTAGE +2.0					
407	204	0	130/3460	3.8	–	–	–	+
349	262	0	84/3500	2.4	–	–	–	+
333	289	0	63/2120	3.0	–	–	–	+
408	297	0	117/4040	2.9	–	–	–	+
180	396	0	119/5080	2.3	–	–	–	++
346	420	0	79/3180	2.5	–	–	–	+

*This equation actually represents the ratio of quartz to aluminum and not the true percentage. Due to the fact that they are practically the same and we have used percentage throughout the paper we have used this term in order not to confuse the reader.

\+ =slight amount of fibrosis.
++ =moderate " " "
+++ =marked " " "
++++ =massive " " "

Note.—The aluminum percentage above represents the total aluminum present. Allowance must be made for the average amount present in control animals.

TABLE IX.

QUARTZ DUSTING 12 HOURS, ALUMINUM DUSTING 40 MINUTES DAILY

Rabbit number	Period of dusting (days)	Removal from dust (days)	Lung assay: *Mg. per cent Al / Mg. per cent SiO_2 × 100 = Percentage		Fibrosis present in: Peribronchial lymphatics	Perivascular lymphatics	Alveoli	Alveolar wall thickening non-fibrotic
			ALUMINUM PERCENTAGE –0.5					
647	136	0	7.5/2880	0.5	–	–	–	+
			ALUMINUM PERCENTAGE 0.5 TO –1.0					
796	161	150	35/3890	0.8	–	–	–	+
784	161	120	3.6/695	0.5	–	–	–	–
777	161	28	42/4480	0.9	–	–	–	–
642	206	0	50/990	0 5	–	–	–	–
640	206	0	5/940	0.5	–	–	–	–
649	274	0	74/7800	0.9	–	–	–	+
641	285	187	30/3380	0.9	–	–	–	+
631	285	120	100/11900	0.8	–	–	–	+
638	285	127	43/8600	0.5	–	–	–	+
633	285	81	40/6500	0.6	–	–	–	++
			ALUMINUM PERCENTAGE 1.0 TO –1.5					
795	180	0	34/3110	1.1	–	–	–	–
643	225	0	76/5570	1.4	–	–	–	–
620	244	0	70/6500	1.1	–	–	–	–
618	270	0	70/5420	1.3	–	–	–	–
624	285	97	126/10200	1.2	–	–	–	–
750	285	67	44/4070	1.1	–	–	–	+
648	285	75	92/6360	1.4	–	–	–	+
634	285	97	68/6000	1.1	–	–	–	++
			ALUMINUM PERCENTAGE 1.5 TO –2.0					
625	222	0	110/6900	1.6	–	–	–	–
619	285	97	120/6180	1.9	–	–	–	+
			ALUMINUM PERCENTAGE +2.0					
626	164	0	190/6350	3.0	–	–	–	–
622	171	0	43/1950	2.2	–	–	–	–
616	285	15	150/6450	2.4	–	–	–	–

*This equation actually represents the ratio of quartz to aluminum and not the true percentage. Due to the fact that they are practically the same and we have used percentage throughout the paper we have used this term in order not to confuse the reader.

\+ =slight amount of fibrosis.
++ =moderate " " "
+++ =marked " " "
++++ =massive " " "

Note.—The aluminum percentage above represents the total aluminum present. Allowance must be made for the average amount present in control animals.

silicosis, occurring first in the peribronchial and perivascular lymphatics and later in the alveoli. A detailed description of the pathological findings is not given here as they are the same as reported in our preliminary paper.[1] It will be observed that the aluminum content of these lungs varies considerably. This is due to the varying amounts of aluminum silicates known to be present in the quartz used for dusting. No hydrated alumina could be demonstrated in any of these lungs by the aurine staining method (Figs. 5 and 6).

Admixtures of quartz and aluminum.—Quartz and aluminum pellets were ground together to produce variable mixtures of dust in different cages containing approximately ½, 1, 2, 3 per cent of aluminum, in order to determine the minimum concentration necessary to prevent fibrosis. The findings in these animals are tabulated in Tables VIII and IX according to the percentage of total aluminum found in the lungs in relation to the silica content. It was not possible, by direct chemical assay, to distinguish between the amount of aluminum derived from the silicates present in the quartz, and that from the inhaled aluminum powder. The amount of aluminum derived from the inhaled aluminum powder can be determined indirectly by deducting from the total aluminum content the average percentage (0.4) of aluminum present in the lungs of the control animals. When this blank is deducted it will be seen from Table VIII that the

lungs of some animals having less than 1 per cent aluminum show fibrosis. These lungs presented a striking contrast when compared with those lungs containing more than 1 per cent aluminum. However, the fibrosis present in the lungs of these animals was not as extensive as that observed in the control animals having comparable exposures.

The hydrated alumina demonstrable by aurine staining in these lungs had a patchy distribution. *The outstanding finding was the absence of fibrosis in all areas where demonstrable hydrated alumina was present, whereas in those areas showing fibrosis no hydrated alumina could be detected* (Figs. 7, 8, 9 and 10).

Alternate dusting with quartz and aluminum.—The question arose as to whether it was necessary to have aluminum dust intimately mixed with the silicious dust during inhalation or could the same objective be attained by the alternate dusting with aluminum and quartz. As this would be of importance in the practical application of aluminum dust for the prevention of silicosis the following experiments were conducted.

A group of animals was exposed for twelve hours daily to quartz dust (20,000 particles per c.c.) then transferred to a cage where they received aluminum dust (7,000 particles per c.c.) for 40 minutes. Another group received 40 minutes of aluminum dusting prior to the 12 hours of quartz dusting.

The findings in these animals are recorded in Table IX. *No evidence of fibrosis was observed in the lungs of these animals.* The dust present in these lungs produced only a foreign body reaction similar to that described in detail in a preliminary paper.[1] The most important finding was the uniform distribution of the hydrated alumina *intimately mixed* with the quartz particles. This contrasted with the *patchy distribution* seen in the animals exposed to admixed quartz and aluminum dust (Figs. 9 and 10).

PATHOLOGICAL DISCUSSION

All the experimental evidence indicates that the inactivation of quartz by aluminum is not a systemic reaction but takes place only when aluminum is closely associated with quartz in body cells or fluids. It has been shown by subcutaneous injections and dusting experiments that the minimum amount of metallic aluminum necessary to inactivate quartz in tissues is 1 per cent when *uniformly* mixed with quartz.

The method used in these experiments to produce an admixture of quartz and aluminum dust was not entirely satisfactory. While chemical analysis and solubility tests indicated a sufficient percentage of aluminum to inactivate the quartz, the size of the aluminum particles varied considerably. Following recharging of the boxes or mills most of the aluminum dust produced for a few days was too coarse to gain entry to the lung. As grinding progressed the aluminum dust produced was considerably finer, the majority of the particles being less than 3μ in diameter. We believe that this accounts for the patchy distribution of the aluminum and the areas of nodules containing no demonstrable aluminum in the lungs of the animals dusted with admixtures of quartz and aluminum. In spite of this faulty distribution these animals developed less fibrosis and at a much slower rate than the control animals. A better procedure to follow would be to introduce into the cages containing the quartz dust a desired quantity of aluminum powder (-3μ) from an independent source.

The aluminum dust to which the group of rabbits was exposed for 40 minutes daily was produced by grinding aluminum pellets together. This dust was constantly uniform, most of the particles being under 3μ in diameter, which accounts for the uniform distribution of the stainable hydrated alumina in the lungs of these animals and the absence of any fibrosis.

At the present time we have no evidence to indicate how long the coating of hydrated alumina will continue to inactivate quartz in the lung. The stability of the hydrated alumina coating through the hydrogen ion concentration range corresonding to that of the normal lung tissues and the inactivation of quartz in the dusted animals for periods up to 17 months indicate that it is relatively permanent. We do not believe, however, that the factor of the permanency of the coating is of primary importance. This is indicated by results obtained on a group of silicotic rabbits exposed daily to aluminum dust for a period of 20 to 60 minutes and killed at intervals from one to six months. Sections of these lungs indicate that the aluminum dust is being engulfed mainly by the quartz containing dust cells (Figs. 11 and 12), and that the further solution of these particles is pre-

vented, halting further progression of fibrosis, and allowing these cells to be eliminated in the bronchial mucus. These experiments indicate that should the coating be gradually removed by the lung fluids over long periods of time, subsequent dusting with aluminum powder should recoat and again inactivate the quartz particles. Observations are being continued on the animals remaining in the various experimental groups.

THE INDUSTRIAL APPLICATION OF ALUMINUM

The practical application of metallic aluminum powder for the prevention of silicosis has been questioned by some, who claim that an explosive hazard would exist if aluminum dust were introduced into the atmosphere of a mine. The authors prior to the publication of their first paper were familiar with the work on the explosive properties of metallic aluminum powder done by Mason and Taylor,[10] of the Aluminum Company of America. These investigators demonstrated the fact that the minimum amount of aluminum powder required to produce an explosive mixture in air is 40 mg. per litre (40 ounces per 1,000 cu. ft.). They conducted further tests, using varying mixtures of silicious dust and aluminum powder to determine the explosive limits. They found that when two parts of silicious dust and one part of aluminum powder were used the mixture would barely ignite if blown through a flame. In the explosion chamber, using enough of this mixture to give five times the minimum explosion concentration of aluminium powder, no increase in pressure could be obtained on ignition. Obviously it would be impossible to produce an explosive mixture in a mine with any such quantities as would be required for our purpose.

Experimental work has been in progress at the McIntyre mine for some time to determine various methods of applying metallic aluminum powder for the prevention of silicosis. Certain methods have been devised whereby an excellent dispersion of the powder can be obtained in the underground atmosphere. By using small quantities of aluminum powder, varying from 3 to 20 grams, dispersed in a dust cloud, reductions in solubility of 90 per cent or better were obtained from dust samples taken 150 to 300 feet from the face, following a drift round blast, having a volume of 8,000 cu. ft. These investigations are still in progress and will be reported at a later date.

CONCLUSIONS

1. Metallic aluminum on being converted into hydrated alumina reduces the toxicity of quartz in tissues in three ways, (*a*) by flocculation; (*b*) by adsorbing silica from solution; but (*c*) *chiefly* by coating the quartz particle with an insoluble and impermeable coating.

2. This coating has been definitely identified as a gelatinous hydrated alumina, which on drying forms the crystalline alpha aluminum monohydrate, Boehmite ($Al_2O_3.H_2O$).

3. The alpha monohydrate and trihydrate of aluminum have no effect on preventing silica from going into solution.

4. Other silicious materials when treated in a similar manner to quartz and aluminum in water appear to be coated by the precipitated gelatinous aluminum hydrate.

5. Under conditions as noted silicosis can be produced in experimental animals by exposure to quartz dust for five months.

6. No animals whose lungs on analysis contained 1 per cent or more of metallic aluminum have shown any evidence of silicosis up to periods of seventeen and a half months, in contrast to well developed silicosis in the quartz control rabbits in seven months.

7. In lungs having less than 1 per cent aluminum where fibrosis is present there is no demonstrable evidence of hydrated alumina in the fibrotic areas.

8. In lungs where the hydrated alumina is shown on staining to be intimately and uniformly mixed with the silica particles fibrosis has never been found.

9. Aluminum dust for the prevention of silicosis should be of a particle size below 5 microns and grease-free.

10. It should be uniformly mixed in any inhaled dust and bear a definite percentage to this dust at all times.

11. To prevent silicosis aluminum dust may be inhaled daily independently of the silicious dust.

12. The aluminum dust must be sufficiently concentrated in the inhaled dust to provide a minimum concentration in the lung of 1 per cent at all times.

13. The inhalation of aluminum dust in large quantities over long periods of time showed no effect on the general health of the animals and no evidence of toxicity or damage to tissues.

14. Aluminum dust in any concentration necessary to prevent silicosis has been shown to

be hundreds of times below the explosive concentration of aluminum powder.

It again affords us pleasure to record that the experimental work above described, which was conducted both at the Department of Medical Research and the McIntyre Mines was made possible by the continued interest of Mr. R. J. Ennis, General Manager of McIntyre Porcupine Mines Limited, and by the financial support of the same company, supplied on the recommendation of its President, Mr. J. P. Bickell. We wish to thank Sir Frederick Banting and members of the staff of the Department of Medical Research for the facilities and cooperation extended to us in checking our original findings. For the definite identification of the hydrated alumina coating on the quartz particles we thank most kindly Dr. Lester H. Germer and Mr. K. H. Storks of the Bell Telephone Laboratories, New York City. We would *particularly* express our appreciation for the cooperation so generously extended to us by Dr. Francis C. Frary, Director of the Aluminum Research Laboratories (Aluminum Company of America), and for supplying us with various forms of metallic aluminum and its compounds.

And finally we would record that same appreciation of the excellent work and dependable results provided through the efforts of Mr. F. Bremner, Chief Chemist of the McIntyre Porcupine Mines, and Mr. H. L. Collins (formerly of the Department of Medical Research), as well as of other members of the McIntyre staff.

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THE CLINICAL SIGNIFICANCE OF A LUMP IN THE BREAST*

BY E. M. EBERTS

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THE title of this paper must conjure up at once the malignant lesion; but there are other swellings of the breast which are also of great moment, in that they may be, and frequently are, precancerous in nature. I refer to cystic nodulations and to papillary cyst-adenomata. There are of course, too, the chronic inflammatory swellings, tuberculous and luetic, but in the time at my disposal I cannot touch on these, other than to say that in a differential diagnosis the possibility of their existence should not be overlooked.

In any consideration of breast lesions 99 per cent of one's mental view is blackened out by the thought of cancer. I do not expect to add anything to your knowledge of this scourge, but, by emphasizing again the relation between benign and cancerous lesions of the breast, and by stressing once more the importance of vigilance, conscientious clinical examinations, early operation, and adequate histological search of all tissues removed, I venture to hope that some at least of my hearers may be stimulated to a determination to snatch more and more of these brands from the burning.

In 1846 Sir Benjamin Brodie[1] published a paper on benign cystic disease, and since that time there have been innumerable contributions to the subject. In 1883 Reclus[2] stressed two important features of the disease, the multiplicity of the cysts and the frequency of bilateral involvement. In 1892 Schimmelbusch's[3] paper on "Cyst-adenoma of the breast" appeared, embracing not only cystic disease but papilloma formation as well. In 1901 Paul[4] made the arresting statement, founded upon clinical experience, that the epithelial hyperplasia present in cystic lesions of the breast not infrequently terminated in carcinoma. Paul also said that, in his opinion, duct papilloma (or benign neoplasia, as it is now described) was but an advanced stage of simple epithelial hyperplasia, and further that this lesion was often the immediate precursor of cancer. So far as I know, Paul was the first to recognize the intimate relation between cystic lesions of the breast and malignant disease. Latterly Cheatle[5] has confirmed Paul's views on this subject; and since the appearance of Cheatle's text, "Tumours of the Breast", Ewing,[6] whose opinion is so universally accepted on this continent, has written:

"I have been able to confirm these observations [of Cheatle] . . . It is . . . clear that chronic mastitis is a very important predisposing condition to mammary cancer. It appears, also, from the histological evidence, that many cancers arising in chronic mastitis do not represent wholly new processes, but, on the contrary, are the natural result of steadily increasing epithelial over-

* Read at the meeting of the Inter-state Postgraduate Association of North America, Philadelphia, November 1, 1938.

growth, which is originally inflammatory and affects not embryonal or misplaced tissues, but the normal and adult glandular epithelium.''

Finally, Boyd,[7] who in an earlier book said that

''It has never been proved pathologically that chronic mastitis can become converted into a carcinomatous process'',

in the recent (third) edition of his ''Textbook of Pathology'' makes the statement that.

''from the pathological point of view it is possible to trace a long series of progressive changes in the duct epithelium, until the ducts are filled with masses of cells which are indistinguishable histologically from cancer cells and which may finally break through the wall and invade the surrounding tissues.''

and the further statement that

''cystic hyperplasia is a precancerous condition which should be treated as such . . . It seems probable that the cancers which originate in cystic hyperplasia are intraduct to begin with and of relatively low malignancy. It is therefore to be expected that even local removal of many of these lesions should not be followed by recurrence. This is mentioned because Bloodgood and others have used as an argument against the relationship of the two conditions the fact that local removal of the breast for cystic hyperplasia is seldom followed by the development of carcinoma.''

Instead of approaching this subject by following the usual sequence of cyst, papilloma, and malignant neoplasia, one might work from the centre in two directions and thus strengthen the argument that cystic disease may be a precursor of carcinoma; by which I mean that, if we accept (and I think it is generally accepted) the belief that duct papillomata develop in a dilated cystic duct and that a papillomatous neoplasm is especially likely to be the seat of malignant change, then we must agree that simple cystic disease itself may be, though more remotely, a precursory lesion of cancer.

Many papers have been published refuting the thesis that cystic disease is related to carcinoma and maintaining that the incidence of malignant disease is no greater in the cystic breast than it is in the normal breast. Fortunately, the weight of clinical and pathological evidence is against this view, for, were it given wide credence by the profession, many practitioners might feel justified in deferring the exploration and histological examination of those breast lesions which they presumed were innocuous because they were clinically of the cystic type.

While there are no statistics upon the percentage of cases of cystic and papillomatous disease which become malignant, it is our experience at the Montreal General Hospital that between 20 and 30 per cent of the whole breast sections from frank carcinoma of the breast show, in association with the cancerous lesion, cystic and papillomatous changes throughout those portions of the breast not involved in the malignant process.

CYSTIC DISEASE

Cysts of the breast may be single or multiple. Solitary cysts are manifested clinically as globular elastic swellings, freely movable within the breast tissue. Multiple small cysts usually form a triangular area of nodularity, with the base toward the periphery of the breast. In the larger cysts fluctuation may be elicited. On transillumination there is no opacity. If the cyst is tense, deep-seated, and fixed it may suggest carcinoma, but in benign cystic disease there is no retraction or tilting of the nipple and no flattening, lessened mobility, or stippling of the skin; the tumour is translucent, and the axillary glands are not involved. Serous discharge from the nipple may occur from time to time, with subsidence of the swelling. Pain may be a marked feature, especially at the menstrual period, but commonly it is absent.

Because of atrophy produced by pressure the lining epithelium of large single cysts is seldom the seat of malignant change. It is usually in the smaller multiple cysts, that is, in areas of fine nodulation, that carcinoma develops. Cheatle[5] regards finely nodular areas with grave concern, and reports 6 consecutive cases of local nodularity, without other clinical signs of carcinoma, in which, after radical operation, the histological examination revealed malignant neoplasia superimposed upon simple hyperplasia, the malignant neoplasia being in only one case in the primary stage and confined to normal anatomical limits. In the other five cases periductal or peri-acinal infiltration was found as well, indicative of the second stage of malignant growth; and in two of these cases metastases were found in the axillary lymph nodes—instances of the third stage, the stage of dissemination.

Cystic disease may involve one or both breasts. Paul[4] and Cheatle[5] insist that carcinoma is especially likely to develop in the bilateral form. In such cases, of course, the danger of ultimate malignant change is necessarily doubled. I have had several patients with bilateral cystic disease who, after undergoing unilateral segmental resection or simple mastectomy for cystic disease (confirmed microscopically), had within a dec-

ade to have the opposite breast removed for carcinoma associated with areas of cystic disease.

The treatment of benign cystic disease varies. Large cysts should be aspirated, the fluid centrifugalized, and the cellular residue examined for tumour cells (both in smears and after fixation). Should the microscopical examination show the presence of carcinomatous cells, a radical operation should be promptly performed. Otherwise, nothing further need be done at the time, but the patient should be kept under prolonged observation, because small marginal cysts are frequently present and in these carcinoma may develop later. In the treatment of the finely nodular cystic areas, in which, as we have seen, carcinomatous change is more likely to develop, the only safe methods are (1) in younger subjects, segmental resection and a thorough examination of the serial sections, with a secondary, radical, operation should a focus of malignant change be found; and (2) in older subjects, a primary radical operation, or at all events a complete mastectomy. To quote Ewing[6] again:

> "The decision to leave untouched a definite grade of cystic mastitis should be made only with the knowledge that carcinoma frequently develops in such organs."

Cysts of the breast have their origin in the acini and terminal ducts. In the early stages of the disease one finds, histologically, hyperplasia of the lining epithelium of the ducts and acini, with desquamation and death of the cast-off cells, a purely benign process, without involvement of the peri-acinal or periductal connective tissue. In some cases the disease never progresses beyond this stage. But in others, with the passage of time or through the action of some irritant (possibly, as Ewing suggests, chronic irritation due to retained secretion), a change takes place in the biological status of the epithelium; cell is piled upon cell until the lumina of the ducts and acini become filled with viable cells, which retain their normal staining properties. This is a form of benign neoplasia, a precancerous lesion. It is in such a lesion that malignant neoplasia develops (Figs. 1 and 2).

PAPILLOMATOUS LESIONS

Another form of benign epithelial neoplasia and one with a yet greater tendency to malignant change is the papilloma. Papillomata develop within the ducts, in many instances in preexisting ductal cysts. They may have a single well-formed stalk derived from the periductal connective tissue and containing strands of the elastica; often they are multiradicular. In the composite form especially the branching filaments coalesce, forming pseudo-acini. The similarity between these formations and true adenoma gave rise to the term "papillary cyst-adenoma" or intracanalicular cyst-adenoma. The multiple minute papillomata so often seen in the walls of acinar cysts are supported by the subepithelial connective tissue only, and, although they are, strictly speaking, neoplastic elements, they do not undergo malignant change because they disappear as the cyst enlarges and intracystic pressure increases.

Papillomatous growths in the breast tend to become malignant, as they do in the stomach and colon, or indeed wherever they develop on a moist surface; but, although they are frequently multiple, the malignant explosion occurs, as a rule, in but one, the change beginning at the base of the stalk. Here again is seen the analogy to the course of papillomatosis in the intestinal tract (Figs. 3 and 4).

In addition to the pedunculated form of papilloma, sessile epithelial neoplasias may occur, devoid of connective-tissue elements. These are of even greater pathological significance.

Papillomata develop usually in subjects between the ages of 35 and 45. The most positive clinical sign of this disease is the intermittent discharge of blood or bloody serum from the nipple. The discharge as a rule comes from one duct only. Associated with this there may be a feeling of discomfort; or, owing to distension of the duct with blood, there may be pain, which is important because it draws the patient's attention to the breast. Palpation may reveal the presence of a localized swelling in the region in which the pain has been noted, and pressure upon this swelling will usually induce further serous or bloody discharge. On the other hand palpation may be entirely negative. This fact, however, does not detract from the seriousness of the objective symptom of bleeding, nor does it offer any surety that ductal carcinoma is not present, even widespread. My own observations lead me to believe that a clinical diagnosis of carcinoma can be made with certainty in cases of bloody discharge, if careful palpation of the base of the nipple reveals a thickening in the line of the duct from which the discharge has come.

In considering the treatment of benign papillomata one must give weight to the statement of

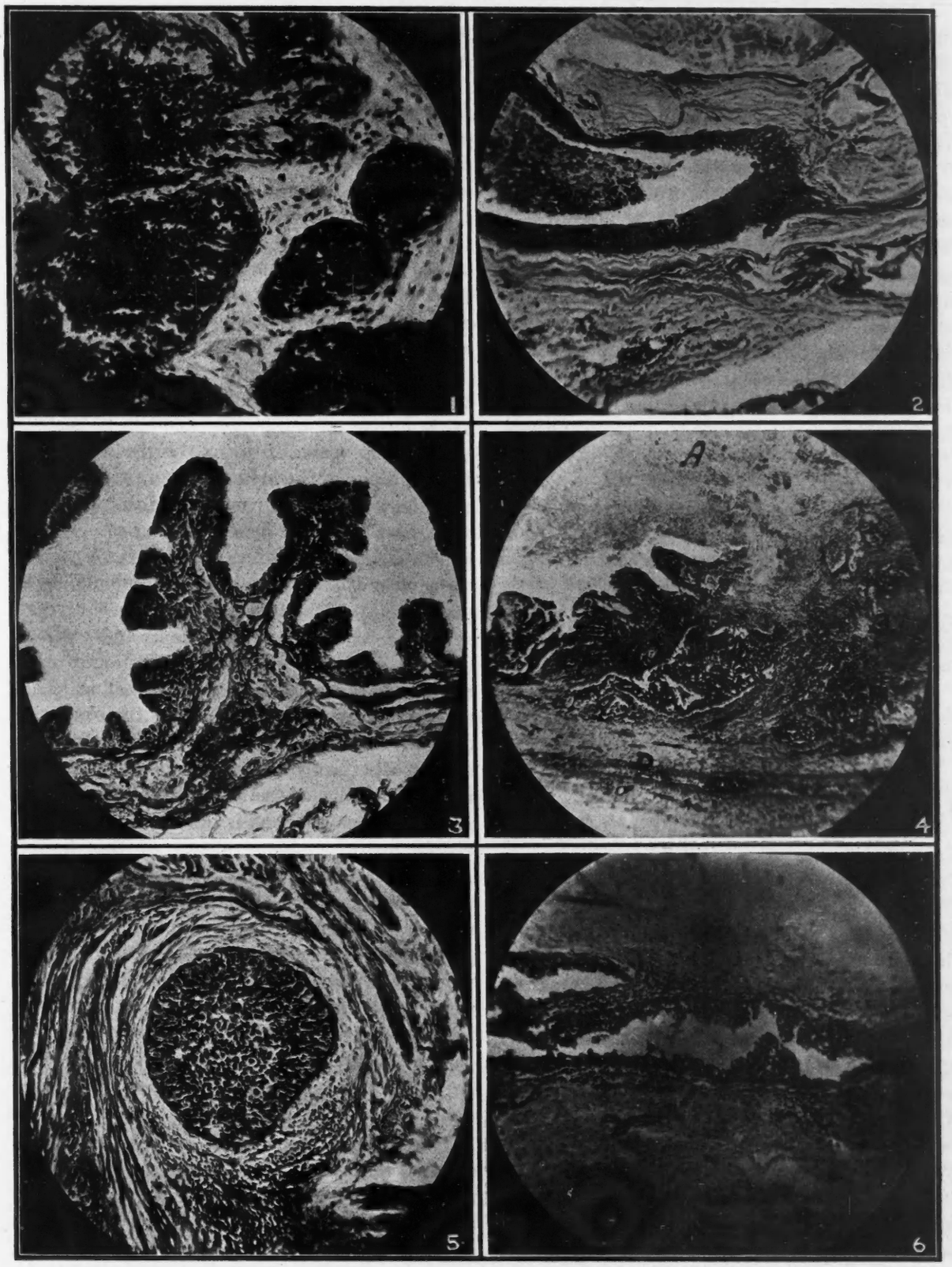

Fig. 1.—Acini filled with viable, small, uniform, epithelial cells, which stain deeply and show no degeneration. The basement membrane is everywhere intact. A precancerous alveolar lesion. **Fig. 2.**—Longitudinal section mammary duct, showing marked epithelial hyperplasia. The cells are stratified, regular, and small, and stain uniformly. In the lumen are desquamated, degenerated, epithelial cells and blood cells. A precancerous ductal lesion. **Fig. 3.**—A ductal papilloma. All of the tissue elements of the duct wall are included in the stalk. The black fibrils are from the elastica. The epithelium is hyperplastic. A precancerous ductal lesion. **Fig. 4.**—Ductal papilloma, showing at top "A" degenerated papilloma; on right at "B" carcinomatous degeneration in stalk; on left at "C" extension along the inner wall of duct; at bottom "D" ductal wall. **Fig. 5.**—Malignant neoplasia in mammary duct. Duct filled with irregular polygonal cells varying in size. There are several mitotic figures. The lining epithelium is entirely replaced but the myo-epithelial layer is intact. There is periductal lymphocytic infiltration but there are no cancer cells in the periductal tissues. **Fig. 6.**—From whole breast section, which shows, as does this high power field, intra-epithelial cancerous invasion of whole ductal tree, but without periductal infiltration. An example of extensive *primary* malignant process, without palpable tumour formation, which latter is present only in the secondary stage of the malignant process—the stage of infiltration.

Adair,[8] Judd,[9] and Miller and Lewis,[10] that in their experience carcinoma has been demonstrable in approximately 50 per cent of breasts operated upon for bleeding from the nipple, irrespective of clinical evidence of tumour. While in selected cases wide local excision may seem to be justifiable if the growth removed is histologically benign, it is always attended by risk, because one cannot be sure that the particular papilloma removed was the cause of the bleeding, or that there is not malignant change in a papillomatous lesion situated elsewhere in the breast. My own feeling is that a breast from which bleeding has occurred should be removed, and that, if the bleeding is associated with ductal thickening, the axilla should be dissected as well.

CARCINOMA OF THE BREAST

While proceeding with the discussion of carcinoma *per se* I should like you to have constantly before you this very significant table.

TABLE I.
SURVIVAL AFTER OPERATION FOR CANCER OF THE BREAST

The percentage of cases which show glandular metastases at operation is	65
If glandular metastases are not present at time of operation the survivals are	5 years – 70% 10 years – 54% 15 years – 43% 20 years – 33%
If glandular metastases are present at time of operation the survivals are	5 years – 25% 10 years – 16% 15 years – 10% 20 years – 7%

This table illustrates vividly the importance of operation before the occurrence of glandular metastases.

At present we are confronted with the deplorable fact that the results obtained in the surgical treatment of carcinoma of the breast do not show a progressive improvement, although this lesion is the most readily discernible of all malignant growths, with the exception of epidermoid carcinoma of the lip. There is little evidence that the malignant breast tumours seen today in either the public services or private practice are younger or smaller than those seen 20 years ago. Nor has there been any appreciable reduction in the percentage of cases which show axillary metastases. These disappointing results are unquestionably due, in a large measure, to the fact that adequate surgical treatment is not instituted soon enough. Only about 25 per cent of patients seek surgical aid within from one to three months of the discovery of the lesion. The responsibility for this delay rests with the patient, the textbooks, and the practitioner.

To deal with the patient first. Many women have an aversion to a breast examination, and all a natural repugnance to a mutilating operation. Further, the majority of women do not know the significance of a painless tumour or of bleeding from the nipple or of retraction of the nipple developing in adult life. They have a deep-rooted belief that a lump in the breast which is painless cannot be serious. The patient is responsible for delay in about 50 per cent of all cases, a delay of four months or longer after the discovery of the tumour. To combat this lay belief in the importance of pain as a symptom, an intensive effort should be made to instruct women in all walks of life on the gravity of painless swellings of the breast, and in this campaign of enlightenment every member of the profession must bear his share by instructing his personal clients and encouraging all women, especially those over 35 years of age, to submit to an examination of the breasts at least once a year.

Second, there are the textbooks and their inevitable influence upon the practitioner when confronted with a lump in the breast which he finds it difficult to classify. The textbooks depict only advanced lesions, whereas the hopeful cases are those in which there is no mamillary deformity, fixation of the skin, or axillary lymph-node involvement, that is, cases which show no visible or depictable evidence of the disease. Again, the textbooks lay far too much stress upon the symptom of pain. Instead of pain there is in the early stages simply an awareness on the part of the patient that there is something wrong with the breast, minor sensations such as tingling or a dragging sensation when the patient is lying on the opposite side; later, possibly, darting pains, which however are generally disregarded if the patient herself does not feel a lump in the breast.

Third, there is the practitioner, and in this category I include not only the general practitioner but specialists such as gynæcologists and obstetricians who at any time undertake to give an opinion on a breast condition. In a large percentage of cases the prognosis rests with the man who first sees the case; yet how often the examination to which the patient is subjected is perfunctory and inadequate, and the advice given wholly worthless. My experience covers many cases in which a fair prospect of perma-

nent cure has been blotted out because the practitioner to whom the patient first applied did not appreciate his responsibility.

Then, how frequently the patient is assured that, because of her youthfulness, because she has not yet reached "the cancer age", the palpable lump in the breast cannot be cancerous, whereas we know that cancer of the breast may occur in the second decade, that it is not uncommon in the third, and that a great many cases (25 per cent in fact) occur in the latter half of the fourth and the earlier years of the fifth decade, generally before the menopause.

Further, men inexperienced in surgical practice frequently undertake limited breast resections for a palpable lesion without making immediate frozen sections—often without submitting the material removed to an accredited laboratory for histological examination. Many of those cases in which the original lesion was malignant are found to be inoperable when later they come into the hands of a competent surgeon, and, according to Harrington,[11] of those cases still considered to be operable 79 per cent then show axillary metastases. The recognition of early malignant lesions of the breast is unquestionably a difficult matter, and in many instances a biopsy must be done, but this should be done only by a competent surgeon and with the patient prepared for a radical operation. The palpable mass or area of thickening should be widely excised, not cut into, and frozen sections examined immediately. If carcinoma is found, a radical operation should be performed then and there.

Finally, because the lesion does not conform to textbook illustrations, or because it is painless, or is assumed to be a cyst or a benign fibroadenoma, many practitioners are guilty of the inexcusable practice of keeping cases under observation over prolonged periods, instead of promptly sharing the responsibility with an experienced surgeon. In 25 per cent of breast cancer cases radical treatment is unduly postponed because of the ignorance or dilatoriness of the practitioner.

That cancer of the breast is not wholly intractable is shown by the number, though small, of 15 and 20 year survivals. Where are we to turn for hope that these numbers may grow steadily larger? If the interest of the profession as a whole could be whetted to a keener appreciation of the cruel, pitiless persistence of this disease; if the practitioner would be more alive to the potentialities of benign lesions of the breast and never dismiss them casually; and if women could be persuaded that in early extirpation lay their chief hope of permanent cure, then I think we might with confidence look for immeasurably better results.

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HOSPITAL AIR-CONDITIONING. — Yaglou outlines the objectives and special problems arising in the control of ward atmospheres, with special reference to operating rooms, postoperative wards, nurseries for premature infants, fever cabinets, allergen-free rooms and oxygen chambers, where air-conditioning has proved of value. The main objectives in air-conditioning operating rooms are to reduce the risk of explosion of certain anæsthetic gases and to protect the patient and operating personnel against extremes of seasonal heat or cold. A single nursery conditioned to 77° F. temperature and 65 per cent relative humidity would fulfil the requirements of the majority of premature infants. Additional heat for weak infants may be furnished in the cribs, or by means of electric incubators placed inside the conditioned nursery, and the heat adjusted according to individual requirements. In this way the necessity for multiplicity of rooms and of air-conditioning units is obviated; the infants in the heated beds derive the benefit of breathing cool humid air, and the nurses and doctors need not expose themselves to extreme conditions. Only extrinsic forms of allergy are benefited by air-conditioning. Patients with bacterial asthma may not respond at all and the symptoms may even be aggravated by air-conditioning. Despite these limitations, air-conditioning methods have definite advantages in the simplicity and convenience of treatment. Hay fever patients are usually relieved of most of their symptoms within an hour's exposure to filtered air. Relief to patients with pollen asthma comes slower, depending on the severity of symptoms. A pollen-free atmosphere is especially valuable when medical methods are not entirely successful, or when desensitization is not advisable owing to concurrent illness. Inexpensive filter units are now available for home or office use, with or without cooling. Few data are available on the combinations of temperature and humidity required to maintain the body at various fever temperatures after initial heating. With saturated air a temperature of about 100° F. appears to be sufficient to keep the body at 105°. In oxygen tents, or chambers, air-conditioning is concerned with the conservation of expensive oxygen gas by removal of excessive heat, moisture and carbon dioxide, in a closed space in which there is no outside air supply other than that from leakage. The operation of hospital air-conditioning plants is as important as the installation. Unless they are kept clean and are serviced periodically by competent engineers, they will not prove satisfactory.—*J. Am. M. Ass.*, 1938, **110**: 2003.

LEUKOPLAKIA AND ALLIED MOUTH CONDITIONS*

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IT is the purpose of this paper to discuss briefly some of the more common conditions of the mouth generally regarded as having a relationship with the ultimate development of cancer. Up to the present time we know little about the various contributory factors in the development of neoplastic growth. Chronic irritation is the one factor about which most data are available. Nowhere in the body is it possible to observe directly, and in such variety, the changes due to chronic irritation as in the mouth; nowhere in the body is it possible to eliminate as many contributory factors as in the mouth.

Even though the conditions to be discussed are simple and commonplace, they are nevertheless extremely important from two viewpoints. The student interested in cancer development can always study these simple changes directly and with profit; the clinician interested in cancer prevention can reduce the incidence of mouth cancer by eliminating these precursory changes while they are still benign and apparently insignificant. Many of the conditions referred to are of strictly local origin—usually direct trauma repeated over a variable period of time. All of the so called precancerous changes have heretofore been regarded as of strictly local origin. It is doubtful, however, if such is the case. Evidence is gradually being accumulated which suggests a contributory constitutional factor, to put it broadly. To be more explicit, there may be a relationship with toxicity, with metabolic deficiencies, or even with hormonal imbalance. The very active work in physiological and biochemistry of these present days is contributing tremendously to the interest, and probably benefit, of the cancer student.

Before discussing the conditions having a possible systemic relationship it would seem best to make brief reference to a number of changes of local origin which need but a word to remind us of the necessity for constant vigilance in small matters. It is impossible, from a practical standpoint, to discuss these changes without referring to their cause, since elimination of both is essential for the future safety of the patient.

Many have their inception in early childhood. The irregular alignment of teeth which permits of rubbing of mucosa over sharp corners or frequent biting of the membrane results ultimately in hypertrophy with ultimate erosion of the surface. Once erosion has occurred, infection permeates the tissues locally. If the infection be of extremely low grade, the cellular reaction to it is not sufficiently acute to cause much discomfort, and a chronic ulcer may exist for some time before it is noticed. More acute infection will call attention more quickly and before much fibrosis has occurred in the submucosa. Occasionally, mild prolonged irritation does not produce erosion, but instead a marked hypertrophic fibrosis beginning in the submucosa and extending deeper until a true fibroma has developed. The same type of irritation at times produces a varicosity of a small group of vessels, resulting in a submucous angioma. Such a process, once started, gains momentum under its own stimulus. All of these simple changes are today preventable by taking advantage of the services of the competent orthodontist during childhood.

In the adult similar changes are brought about by dental neglect. Rough edges from worn-down occlusal surfaces or neglected cavities cut into the mucosa. Fillings and metal dentures become rough on the edges unless watched. Many partial dentures are too complicated, and the same is true of many piece-meal restorations where one bit of work is added to another. The removable prosthesis is usually preferable to the fixed appliance. Full plates are usually worn far too long. The bones of the jaws and face change in shape, but the plates do not. Hence the mucosa supporting the dentures suffers until often the first intimation of trouble is the pain of a fully developed growth. Many of the cheaper plates are made of an inferior quality of rubber carrying chemical impurities. Some of these impurities, notably arsenic, are well recognized carcinogenic agents.

Since the original work of Lain, the idea of mucous membrane damage by electrical current

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stimulation has probably been over-extended. There is no doubt but that it does occur and that it is a real factor in setting up chronic tissue change of a dangerous character. The observer must be careful, however, to see that the requisites for such a reaction are actually present before attributing changes to such a cause. There must be metal fillings or prostheses of two substantially different atomic weights coming into intermittent contact, and with no chance for short-circuiting of the current set up by the aid of these metals in the moist acid field. Further, the damage must be at the exact point where these two metals and the mucosa come into contact.

Another frequent source of mucous membrane irritation often resulting in chronic ulceration with excessive underlying fibrosis is the third molar tooth. Many jaws are not sufficiently developed to permit of adequate space for the third molar. Consequently, its presence results in chewing of the membrane or pressing deeply into it at two points, in front of the ascending ramus of the mandible. These are frequent points of origin of cancer. The relationship seems to be more than casual. Wherever the third molar is causing irritation and is not needed from a dental standpoint it should be extracted.

The safety of the oral mucosa from chronic inflammatory changes with gradually increasing fibrosis, hyperkeratosis and ultimate erosion, necessitates a full complement of smooth teeth, in proper alignment, and without intervening vacant spaces. The periodic dental examination is just as important as the periodic medical examination, and both professions have a responsibility in safeguarding their patients from many unnecessary cancers which have their beginnings in neglected chronic inflammatory changes, due to recognizable causes.

Local sepsis of a chronic character is also an under-rated menace in its probable relation to mouth cancer. Pyorrhœa goes hand in hand with neglect of dental care. Once well established it is extremely difficult to eradicate, but it can be kept under control. A study of tissue specimens from chronically infected gum margins shows all of the changes from simple hypertrophy to beginning downgrowth of the basal layer in an irregular papillary manner and ultimately to fully developed cancer. Too frequently, prompt and proper treatment of early cancer developing under such circumstances is sidetracked for a time by the report of Vincent's spirillum obtained on smear. This organism is endemic in the mouth under such circumstances. True Vincent's infection of symptom-producing degree presents a much more acute picture. The bacterial smear is usually a deterrant rather than an aid in the diagnosis of early mouth cancer. It is my impression that pyorrhœa with its train of progressive tissue changes is too often regarded as entirely a local problem. Observation of many cases leads me to the conclusion that such infection becomes established more readily in patients suffering from debilitating constitutional diseases, such as the anæmias.

In cancer practice it is extremely common to see patients complaining of abnormal sensations, usually of a burning or tingling character, in the mouth. They are convinced that they have cancer but that the physician cannot recognize it. These people should not be dismissed casually. They usually have definite mucous membrane changes, either generalized or at certain localized points. One of the most common local points is the patch of lymphoid tissue on the lateral border of the tongue at the base of the anterior tonsillar pillar. It will appear slightly more prominent than the corresponding area of the opposite side. It may be moderately reddened. The gross change is slight, and the patch is not usually painful to palpation. If, however, such an area be removed and careful histological examination made, it is surprising to note how closely the changes may come to true neoplasm. This particular area is one of the most frequent sites of cancer in the mouth.

Patients whose complaint of abnormal sensation is more generalized are very apt to show on careful observation a tendency to smoothing out of the mucosa at the tip and lateral borders of the tongue. There may be tongue-coating of a fungus character. The gum margins may present the appearance of slight venous congestion or mild cyanosis. These patients are in no special danger of cancer but they will usually be found to be suffering from some form of deficiency disease. Proper attention to the latter will soon clear up the distressing symptoms and early tissue changes noted.

Closely associated with these cases, in turn, are those suffering from chronic intestinal or gastro-intestinal toxicity. They do not necessarily show mucous membrane changes on the anterior portion of the tongue but they do carry heavy fungus deposits over the posterior dorsum

of tongue and usually an associated hypertrophy and chronic infection of the lingual tonsillar lymphoid tissue. This latter shows histological changes comparable to that just described in the patch on the lateral border of tongue. It is in this sort of tissue that most of the radiosensitive lympho-epitheliomas of the hypopharynx develop. Such tongues call attention to themselves by vague discomfort and persistent distressing taste. It is the responsibility of the clinician to find the underlying general cause rather than attempt to deal with the situation on the premise of a purely local basis. It is probable that these cases are a part of the deficiency group, but whether as cause or effect of the specific deficiency is not within the province of this discussion.

Practically all of the changes in the mucous membrane of the mouth coming ultimately under the heading of pre-cancerous lesions or changes are basically of the same character. Their causes may be mechanical, chemical, thermal, or electrical trauma locally, the result of prolonged bacterial infection locally, or of changes brought about indirectly through constitutional disease. The trouble is that this multiplicity of simple conditions is not ordinarily regarded as being of possibly serious import. Leukoplakia, on the other hand, is popularly regarded as a precursor of cancer. It is fortunate that such is the case, and unfortunate that the many other and somewhat comparable changes are not so regarded. The histological changes do not differ greatly, except perhaps that in leukoplakia they are more uniformly progressive, even though not as rapidly progressive in many instances. The chronic ulcer from local trauma is apt to be far more dangerous than the average patch of leukoplakia.

While leukoplakia is not fully understood, it is scarcely proper to say that it is of unknown etiology, as stated by some authors. It is obvious that there are many causes or contributory causes. Smoking has long been regarded as a major cause of many pre-cancerous changes, including leukoplakia. There is no doubt but that it does a great deal of damage. It is my personal opinion, however, that it is the excess of smoking for any given individual that does the harm, rather than just smoking in general.

It is also misleading to associate leukoplakia too completely with tertiary syphilis. Probably more leukoplakia is of non-luetic origin than otherwise. Leukoplakia associated with tertiary syphilis differs clinically from that due to other causes, and presents a slightly different and more uniformly consistent histological picture. Luetic leukoplakia presents a thick, whitish patch, circumscribed, rather oval, and usually many of these crowded together to present a mosaic pattern. Such a group of patches tends to be circumscribed or attached to similar patches by thin bands of like structure. The patches are thick and look as though they could be pulled off with forceps. Such, however, is not possible. The thicker the patch, the more liable it is to fissuring and cracking, thus giving pain if an open surface is exposed or if infection gains access.

Syphilitic leukoplakia is almost invariably limited to the dorsum of the tongue and superimposed on a luetic glossitis. In fact, this particular type of leukoplakia may be induced by a local counter-irritant acting on the mucous membrane covering an underlying and previously existent syphilitic glossitis. The epithelial hypertrophy and hyperkeratosis characteristic of all leukoplakia is augmented in the luetic type by a marked proliferation of connective-tissue cells in the deeper layers of the mucosa similar to the connective-tissue proliferation throughout the tongue muscle in specific glossitis. This deeper change probably precedes the heaping up and proliferation of cornified epithelium to form the characteristic elevated white patches by which the condition is so easily recognized. In the syphilitic cases the stage of extreme superficial proliferation may ultimately give way to a smooth, dull red surface when the stage of tongue retraction is reached.

In non-specific leukoplakia the mucous membrane surface is at first smooth and not elevated. Bluish white patches appear about the points of irritation. These patches may or may not be sharply circumscribed. Later the elevated warty and scaly stage may appear, but rarely is it as pronounced or coarse in appearance as in syphilitic leukoplakia. The papillæ become elongated, the submucosa infiltrated by round cells, the glands hyperplastic, and the small vessels may become so irregularly dilated as to give a semi-angiomatous appearance. As long as the leukoplakic surface is "dry", if one may apply such a term in the mouth, the process is usually within bounds. When it becomes eroded, weeping, or frankly ulcerated it is usually actively dangerous, if not already neoplastic.

Except for the peculiar proliferation and heaping up of cornified epithelium at a very

slowly progressive rate, which produces the characteristic white appearance, the histological changes do not differ greatly from the changes noted in the mouth under many other chronic traumatic stimuli. In fact, one might be tempted to attribute the difference entirely to the rate of tissue change, were it not for the many independent observations made by clinicians during the past few years which suggest a constitutional background, plus probably a local irritant. The observer must be careful to avoid confusion of lichen planus with early superficial leukoplakia. Like many other dermatological conditions which at times involve the oral mucosa the local manifestations in the mouth vary with the variations of the particular condition over the skin surface.

A few years ago Epsom salts was advanced by some European physicians as a specific cure for leukoplakia. This soon proved to be an overstatement, yet there is real value in some instances in the use of small daily doses of this common household remedy. It is doubtful if it exerts any local beneficial effect. Certainly it can be counted upon to reduce toxicity of gastro-intestinal origin. Whether or not there is biochemical virtue in the magnesium sulphate as a salt has not been shown. More recently it is being noted that early non-specific leukoplakia and many other of the non-leukoplakic symptom producing local irritations in the mouth are due to a dietary imbalance or, to be more exact, a dietary deficiency. Correction of this is followed by prompt improvement.

The fact that mouth symptoms in the form of tingling sensations and atrophy of the mucosa over the tip and adjacent dorsum of the tongue are amongst the earliest symptoms of pernicious anæmia has raised the question of a possible relationship of many oral mucous membrane changes, leukoplakic and otherwise, with a liver deficiency. Careful check-up of liver function in such cases strongly suggests such a relationship. Vigorous therapy directed toward the deficiency results in improvement of a character often spectacular. This is also true for some, at least, of the luetic leukoplakias. It is well known that anti-luetic treatment cannot be counted upon to improve the syphilitic leukoplakia. The syphilitics have a liver deficiency either from their disease, or from its treatment, or both. Treatment directed toward detoxication of the liver reacts favourably on the luetic leukoplakia. The treatment, however, must be adequate and not just that usually recommended by the various biological supply houses.

These observations raise questions of far-reaching importance. Leukoplakia has long been known to precede cancer in a substantial percentage of cases. Other forms of chronic irritation, once they have reached a certain stage, are known to go on to fully developed cancer. These varied forms of chronic irritation are most readily studied in the mouth. A local cause of irritation can usually be found in the mouth in any given case. But, is the local irritant, with its resulting chronic inflammatory changes, the real cause or merely a locally exciting cause? In other words, is the local change, or so called pre-cancerous lesion, a local manifestation of a disturbed metabolism in many instances? These questions are raised simply as throwing possibly a broader light on what has been regarded formerly as purely a series of local processes.

The immediate problem under discussion centres in what is to be done about the pre-cancerous lesion. I personally regard as potentially pre-cancerous any gross localized tissue abnormality, erosion or ulceration, which has resisted ordinary simple measures of treatment for over a month. Clinical experience teaches that many such lesions should not be accorded even a month of grace. Diagnosis is the first consideration and should be in the order of the diagnosis of the exact local condition, the local excitant, and the general disease forming a constitutional background, if any. Biopsy should be resorted to promptly and frequently. The value of early biopsy cannot be too strongly emphasized. A positive Wassermann test should never be allowed to hold up histological examination if the clinical appearance is at all suspicious.

Once the local lesion is proved to be non-malignant, its local removal or destruction is adequate local treatment. Biopsy frequently covers this, especially if the lesion be small, and the bipolar cutting cautery the instrument employed in obtaining the biopsy specimen. The local excitant of irritation should be corrected or removed, whether it be an offending tooth, an imperfect or ill-fitting prosthesis, or excessive smoking.

The possibility of a constitutional background in certain of the cases goes far into the field of general medicine and is too broad to go into in detail here. It may cover a most complete medical survey. Active syphilis must, of course, be

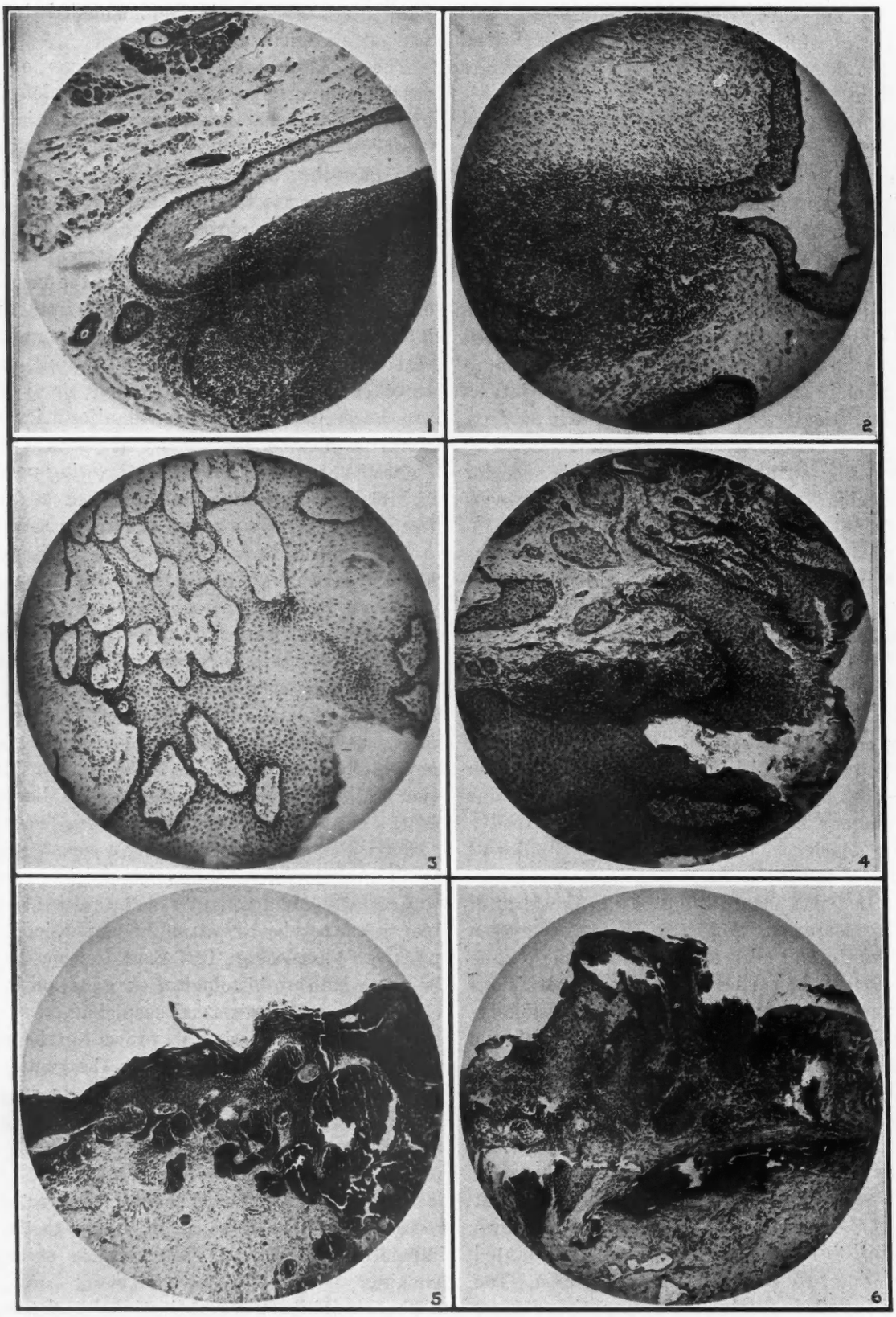

Fig. 1.—Tongue at base of anterior tonsillar pillar. Chronic inflammation in lymphoid tissue. Note changes on one side of crypt. **Fig. 2.**—More advanced changes than Fig. 1. Note basal layer of crypt broken through by inflammatory process. **Fig. 3.**—Chronic inflammatory gingivitis. Note disorderly arrangement of epithelium but with maintenance of orderly basal layer. **Fig. 4.**—Pyorrhœa, longstanding and untreated. Note epithelial thickening, surface erosion, disorderly arrangement but basal layer intact. **Fig. 5.**—Chronic inflammatory antrum with chronic osteomyelitis. Section from mucosa over alveolus. Suspicious of early neoplasm but with complete regression following adequate drainage. **Fig. 6.**—Small sequestra at depth in case of proved carcinoma of cheek successfully treated three years before. Suspicious changes in epithelium cleared up entirely following removal of sequestra.

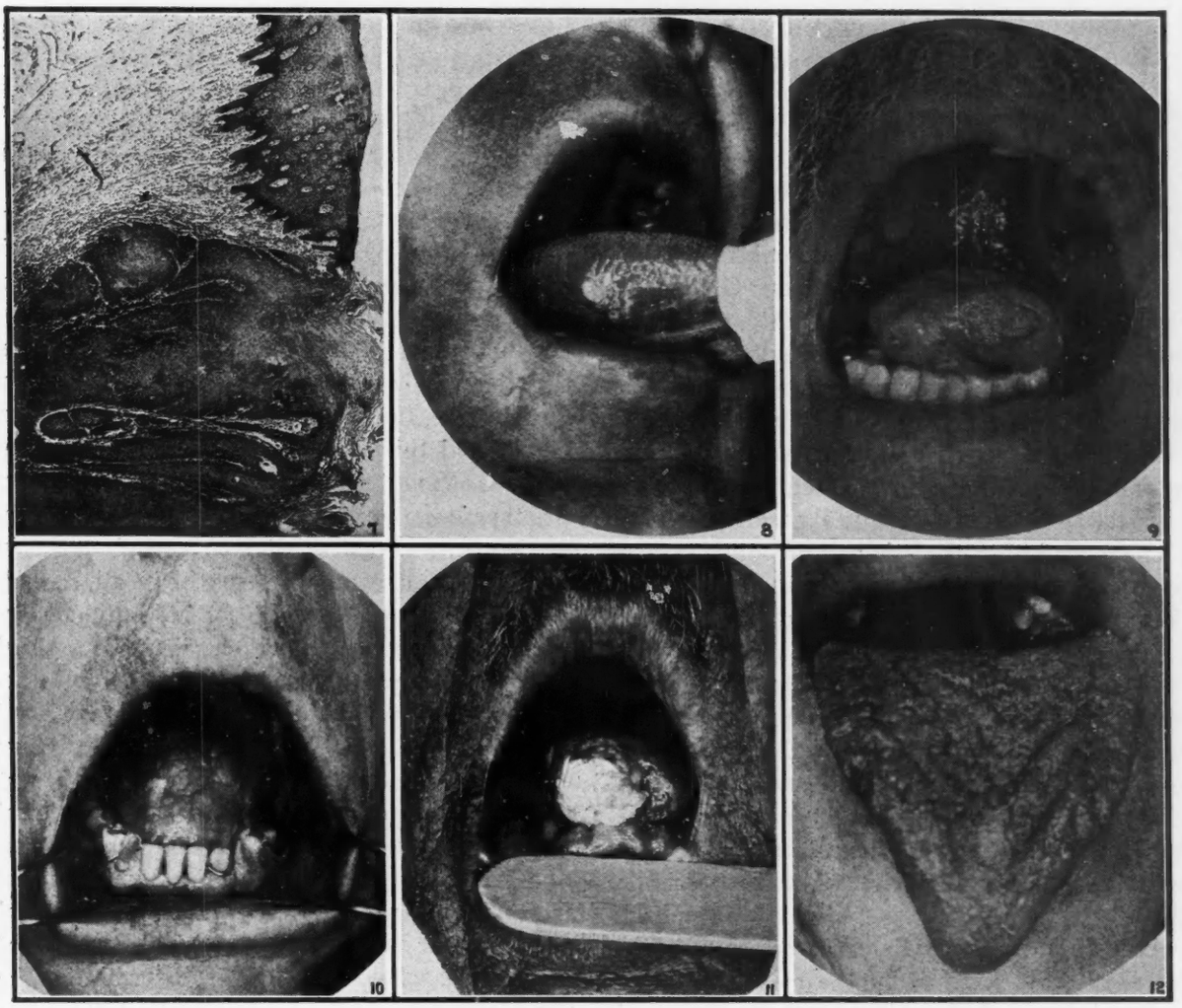

Fig. 7.—Carcinoma of tongue showing changes in mucosa adjacent to actual growth. Fig. 8.—Simple leukoplakia of tongue. Fig. 9.—Leukoplakia on tongue involved by luetic glossitis and previously treated successfully for cancer of opposite side of tongue. No generalized leukoplakia. Note sharp edge on offending bicuspid tooth. Fig. 10.—Generalized syphilitic leukoplakia. Note dental conditions also. Fig. 11.—Leukoplakia merging into true cancer, non-syphilitic. Note points of recent extraction of offending teeth. Fig. 12.—Tongue of deficiency disease. Early macrocytic anæmia.

treated. The deficiency diseases require aggressive therapy, dietary regulation, liver therapy, compensation of vitamin deficiencies, especially B_1 and C, and nicotinic acid, B_2 and ventriculin in those showing an achlorhydria. Those showing a special tendency toward gastro-intestinal toxicity should receive particular attention with suitable agents.

The assistance of such general therapy as just mentioned does much to relieve the old discussion of how to deal with the leukoplakias. That which I have just mentioned goes a long way toward controlling them if pushed with sufficient vigour. It is not, however, a cure-all. It does not restore a normal membrane any more than scarred tissue is "cured" elsewhere and in other parts of the body. These general measures go a long way toward improving the local process and especially toward preventing its further development.

Radium and x-rays are not suitable agents for the eradication of leukoplakia, except in a few instances of extremely localized manifestations. With generalized leukoplakia, and beyond the constitutional therapy briefly outlined, it is best to keep the patient under careful routine observation and resort to local measures only when a localized area tends to change its character. For this a nicely adjusted bipolar cutting current of low intensity is an excellent means of shaving off the questionable area, leaving a minimum of scar.

Facilities for the care of these many small, yet potentially dangerous, lesions are so adequate today as compared with a generation ago that neglect seems inexcusable. By careful attention to such conditions there is no doubt but that the incidence of mouth cancer can be substantially reduced.

LOW BACK PAIN AND SCIATICA*

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BECAUSE the sciatic nerve is the largest nerve and is fairly superficial painful lesions affecting it are easily recognized. Cotugno in Italy first described sciatica in 1746, and in his native country it still occasionally bears his name. An enormous amount of literature on the subject has accumulated. During this period the important contributions concerned clinical examination (Ramond, Charcot, Babinski, Sicard). In the past fifteen years many contributions establishing the etiology of both low back pain and sciatica have appeared. It is my object to present a general view of the whole subject.

The experience of the past few years shows that these two subjects, low back pain and sciatica, must be considered together. Their frequent association in the same patient, even at different times, is often seen. Another important point is that two concomitant lesions may exist, such as a pelvic tumour and a static deformity. Moreover, a patient may have backache with a demonstrable cause, which may also be a cause of sciatica, but he may never have suffered from sciatic pain; an analogous condition is found in the brachial plexus in persons having a cervical rib. Only 5 to 10 per cent of the patients with this anomaly have neurological complaints, and then only when, for any of a variety of reasons, the shoulder droops and causes traction on the nerve roots (Boland). Comparable occurrences suggest a mechanical origin for sciatic algia. In fact, the more cases we see, the more we feel that, apart from a few rare primary conditions of the nerve itself, sciatica is nearly always the result of mechanical disturbances of the upper and lateral joints of the sacrum. I propose to review some of the difficulties to be encountered and to discuss the various types of low back pain.

Pitkin[12] has tried to eliminate sources of confusion. The first of these is in the terminology. The terms essential, primary, idiopathic, symptomatic, sciatic pain, sciatic neuralgia, sciatic scoliosis ignore the fact that many causes are known and that lesions about the sacrum may cause referred pain elsewhere than in the distribution of the sciatic nerve, in the gluteal region for instance. Another source of confusion is the origin of the pain. Twenty-four writers feel that the pain is from direct pressure or irritation of the nerve, the sacral plexus or the nerve roots. Ober[10] and thirteen other authors feel that the pain is from pressure in muscular spasm. Another large group ascribe the pain to inflammation. As a matter of fact, each is right in some cases but cannot be correct in all. I was very much struck by the fact that many authors have their own pet causes for sciatica. A third difficulty concerns the lack of accurate delimitation of the sensory areas of this region. Head and Déjerine have both studied the sensory supply of the lower limbs and find different regions supplied by all the lumbar and sacral nerves. A fourth difficulty is that the innervation of the sacro-iliac and the lumbar-sacral joints is not well known. If all this neural anatomy were definitely established, the use of Head's law would be of aid in determining the exact origin of the trouble. Head's law for re-

TABLE I.

LOW BACK AND SCIATIC PAIN

I. PRIMARY LESIONS OF SCIATIC NERVE.
II. POSTURE.
  A. Acute strain.
  B. Chronic strain.
III. TRAUMA.
  A. Involving the vertebræ.
  B. Involving discs.
IV. INFECTIONS.
  A. Of demonstrable etiology.
  B. Of unknown etiology.
V. METABOLIC AND SENESCENT CONDITIONS.
  A. Hypertrophic changes (may be traumatic).
  B. Osteoporosis with pathological fracture.
  C. Osteomalacia.
VI. CONGENITAL ANOMALIES.
  A. Spina bifida.
  B. Sacralization of the fifth lumbar vertebra or lumbarization of first sacral vertebra.
  C. Anomalous facets.
  D. Spondylolisthesis, spondylolysis.
VII. NEOPLASTIC CONDITIONS.
  A. Benign tumours.
  B. Malignant tumours.
VIII. NEUROLOGICAL CONDITIONS.
  Tumours of the spinal cord.
IX. LESIONS IN NEIGHBOURING SYSTEMS.
  A. Gastro-intestinal.
  B. Genito-urinary.

(modified from Ghormley)

* Delivered before the Staff Meeting, St. Mary's Hospital, Montreal, February 9, 1938.

ferred pain says: "Pain in a part of low sensibility in close central connection with a part of high sensibility is felt in the latter region." In this study the parts of low sensibility are the bones, cartilages, and ligaments of the joints surrounding the sacrum, and the parts of high sensibility are the skin areas supplied by the corresponding lumbar and sacral nerves. Finally, the finding of tender anatomical structures by palpation may give misleading information, since by palpation alone it is not easy to distinguish between pain originating in a local area and one which is referred.

It is possible to arrive at a working diagnosis if one knows the causes of sciatic and low back pain and if one makes a thorough enough investigation of the case. I cannot do better than to give the classification somewhat modified, published by Ghormley of the Mayo Clinic.[2] (See Table I).

Primary forms of sciatica are either of rare types such as are due to Von Recklinghausen's neurofibromata and hæmorrhage into the nerve, or of fairly obvious etiology, such as direct trauma by an intramuscular needle and certain cases of poisoning, by benzene for instance.

It is not within the province of this summary to discuss the whole question of posture, but I must point out the connection between poor posture and low back pain. André in 1741 recognized the importance of good posture when he devised the name of the *orthopædic* specialty (to *straighten the child*). I do not believe that the human spine should be curved. The spines of our phylogenetic ancestry were straight. The ontogeny of human beings who approach physical perfection—the athletes—reveals that they are born with straight spines and that they retain flat lumbar segments until they cease training. Then, they continue to eat, unnecessarily, with the same appetite and develop a paunch; the muscles weaken and lordosis appears. Here are the two important elements of the so-called "static" backache, also characterized as "lumbosacral strain". These two factors are also met with in undernourished poorly developed children, and in women, predisposed as they are through lack of physical training, through pregnancy, and through wearing of supportive garments about the abdomen. Goldthwait, who since 1905 has stressed the importance of good posture, describes two types of persons particularly liable to static backache—the visceroptotic type, the more frequent, with a long flexible spine and a lumbar lordosis, and the short thickset type with slight movement in the lumbar spine, which is lordotic.

Other factors producing a painful concavity of the lower spine are, paralysis of the abdominal muscles through infantile paralysis, diseases or deformities of the lower limb tending to throw the trunk off balance, *e.g.*, hip-flexion contracture, unreduced congenital dislocation of the hip, flat feet, and varus deformities due to rickets. Inequality in the length of the limbs is another cause of pain, particularly in late years, through the production of a lumbar scoliosis. Increase in abdominal contents and occupational posture may with time be contributing sources of trouble. Long-lasting stretch in an unnatural position means mechanical derangement of the lumbo-sacral joints leading to a true lumbosacral arthritis. The pain may appear gradually and may be relieved by a short rest; this shows the mechanical nature of the lesion. It is frequently referred along the course of the sciatic nerve. The fifth lumbar nerve is the largest and passes through the smallest intervertebral foramen between the fifth lumbar vertebra and the sacrum; therefore a relatively slight disturbance of the articular relationships can cause compression of this important part of the sciatic nerve.

An acute phase may be ushered in by a fairly slight sudden movement. In the treatment, complete rest in bed may be necessary; even fixation in a plaster jacket is used to bring relief in the acute case. Care must be taken to avoid replacing the lumbar segment too rapidly in a straight line. An application of this principle is seen in the development of low back pain in patients lying in soft beds and suffering from a debilitating illness or in patients subjected to long anæsthesias on a flat table. Consequently a fairly non-resisting mattress is essential. A support in the lumbar region may give relief by maintaining that segment approximately in its habitual position. When the acute stage has subsided the back may be supported by strapping or by a brace. In long-standing cases it is difficult to eliminate the lordosis, but attention should be given to the musculature. Strong muscles will act as good physiological splints. Local heat and massage are very helpful. In severe cases where there is a well established arthritis lumbosacral fusion may be necessary. Prevention is the best treatment; the habit of good posture

backed by well-conditioned musculature will prevent backache, even in the presence of congenital anomalies. The principles of the necessary muscular exercises are described later. Little mention is here made of sacro-iliac strain, just as recent world literature is also silent. True cases undoubtedly exist, but they follow marked deformities and the diagnosis is quite obvious.

Trauma involving the bodies of the vertebræ is fairly easily recognized. In the case of fractures involving pedicles, laminæ, and articular facets the diagnosis is not so easy to establish, but may be strongly suspected from the nature of the injury. It often happens that unrecognized or poorly treated fractures become a source of low back pain after months or even years.

A structure which is frequently traumatized is the intervertebral disc. Following on the work of Schmorl, this important link in the vertebral column has come to be well known and its lesions well studied; in fact, I might say that disc ruptures are the present day fad amongst orthopædists and neurosurgeons as the cause of low back pain and sciatica. Kocher in 1896 described the first authentic case; this occurred in a man with a back injury followed by paraplegia. The autopsy showed extrusion of the nucleus pulposus to such an extent that the cord was compressed. Goldthwait in 1911 had a case with a clinical diagnosis of sacro-iliac strain; after manipulation under general anæsthesia a paraplegia developed. The patient was operated upon, and after laminectomy a narrowing of the vertebral canal was seen. Goldthwait concluded that nothing but a disc lesion could have caused the trouble. It was only after the publication of Schmorl's work about 1930 that the condition came to be recognized clinically. Before then the usual diagnosis was fibrochondroma, chondroma, or loose cartilage. Mixter and Barr have accomplished much in the United States in studying and spreading the knowledge concerning disc lesions.

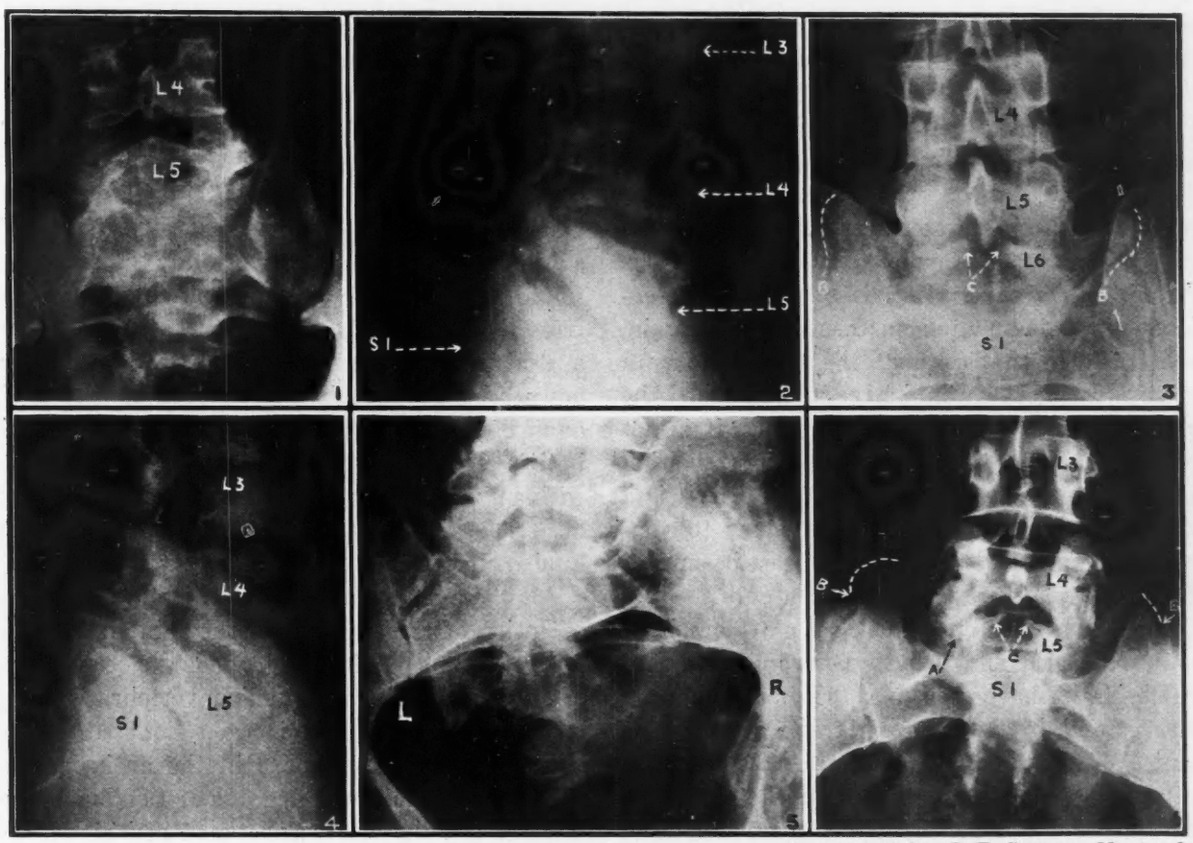
The disc furnishes support between the vertebræ, each one supporting more weight than the one above it. One can well imagine the severe strain on the last—the lumbo-sacral disc. This, in fact, is the one that is most frequently injured. Moreover, the annulus fibrosus has its weakest fibres at the posterior surface bordering on the vertebral canal. Such an injury has two results; (1) a subluxation of the articular facets on account of the narrowing of the intervertebral space, and (2) extrusion of the nucleus pulposus into the spinal canal. These anatomical derangements give rise to two groups of symptoms. The articular facets being no longer in perfect apposition, degenerative changes leading to hypertrophic arthritis occur. This is the usual result when a joint is mechanically altered, for which the term "arthrosis" has been coined. These changes give rise to pain and may become visible on the x-ray plates. Narrowing of the intervertebral space on the x-ray is insufficient to make an absolute diagnosis of ruptured disc. The second group of symptoms, those arising from the entry of a foreign body into the spinal canal, resembles those of spinal-cord tumour. The pain may be described as deep, severe, excruciating, and is often aggravated by coughing or sneezing. The sensory changes are rare because as a rule only one root is compressed and there is a marked overlap in the sensory supply to the skin. The pain is usually unilateral but may be bilateral. On examination lumbar scoliosis, lordosis and kyphosis are frequently seen. The knee jerks are always present, since they are in the domain of the femoral nerve, but in half the cases the ankle jerk is absent on the affected side. A few cases may present atrophy of a muscle group; there may be foot drop. There is incontinence in a few cases. Other symptoms are spasm of the lumbar muscles, limitation of motion in the lumbar spine and in straight-leg raising.

Further investigation includes, apart from the x-ray which may show a narrowing of the intervertebral space, a lumbar puncture. As the extruded nucleus pulposus is fairly small, the block in the subarachnoid space is usually incomplete and the Queckenstedt test is inconclusive, but the total protein estimation of the first few drops of spinal fluid does in the great majority of cases give definite information. These first few drops come from the subarachnoid space where the current of spinal fluid is retarded if not actually stopped. A total protein of 45 mg. per cent or more is very definite evidence of a partial block. If the protein does attain this level it is an indication for a still more conclusive examination, the injection of lipiodol into the subarachnoid space. The other indication is failure to improve under conservative treatment. The injection of lipiodol is not to be undertaken lightly because it is almost impossible to remove, and causes after a time some slight irritation; on the other

hand, the indications are quite definite and there are no false positive results. The technique of the test requires a tilting fluoroscopic table so that the lipiodol may be followed up and down the subarachnoid space. At the moment a partial block is seen an x-ray is taken.

The treatment of this condition in the presence of neurological signs is simply excision of the foreign material by means of a laminectomy. I believe that it is best to complete the operation with some type of lumbo-sacral fusion, particularly if the patient expects to lead an active life. The reason for this lies in the malalignment of the lumbo-sacral articular facets which may be productive of disability at a subsequent period.

In the absence of neurological signs conservative treatment may be undertaken. In the series studied many of the patients had received a variety of treatments, such as physiotherapy, removal of foci of infection, sacro-iliac belts, even sacro-iliac fusion, before the correct diagnosis was established. The logical treatment of a ruptured disc that does not compress the cord or a root is based on the fact that the disc space is thinned, posteriorly, causing the previously mentioned subluxation of the facet joints. This may be alleviated by placing both the upper articular surface of the sacrum and the lower surface of the body of the fifth lumbar vertebra in parallel horizontal planes. In other words an attempt is made to eliminate lumbar lordosis and to bring the sacrum in a perpendicular plane. In practice this is accomplished by applying a plaster corset while the spine is bent forward, the patient's elbow resting on a table of appropriate height. During the early acute stage patients are encouraged to lie on the back with the thighs flexed. When the patients become ambulatory after ten days, the cast is replaced by a brace or corset which also tends to eliminate the lumbar lordosis. The treatment is completed by getting the patient to control voluntarily his lumbar lordosis; this is accomplished by developing the muscles which produce flexion of the lumbar spine, mainly the abdominal muscles and those which help maintain it, the gluteal and hamstring muscles; and by stretching the muscles which produce and maintain lumbar lordosis, the sacrospinalis and the thigh flexors. I have dwelt at some length on



Courtesy of Dr. J. E. Samson, Montreal.

Figs. 1 and 2.—Lumbo-sacral Pott's disease. **Fig. 3.**—Lumbarization, (B) long transverse processes; (C) spina bifida. **Fig. 4.**—Spondylolisthesis. **Fig. 5.**—Sarcoma of right sacro-iliac joint. **Fig. 6.**—(A) Lumbo-sacral arthritis; (B) transverse processes; (C) spina bifida.

disc lesions because the new knowledge of them undoubtedly represents the greatest advance of recent years in the battle against low back pain and sciatica. The papers studied report 128 cases proved by laminectomy in the American literature alone. Capener in England, Glorieux[3] and Mauric[6] in France have also made very complete studies.

Causes of sciatica classed under infection comprise infectious arthritis, spondylitis deformans, myofasciitis, fibrositis, "typhoid spine", tuberculosis of the lumbar region or of the sacro-iliac joint, and acute infection, as, for instance, staphylococcic arthritis of the sacro-iliac joint. Gonorrhœal arthritis is frequently localized in the lumbo-sacral joint, may even cause an infectious spondylitis of all the vertebral joints. Tertiary luetic meningeal lesions have been incriminated in producing sciatica. The etiology of this group, outside of those conditions where a specific cause is found, is vaguely understood. The theory of focus of infection has been greatly overrated. First enunciated by Billings in 1912, it spread like wild-fire over the American continent but was coldly received in Europe. In recent years a reaction is taking place in America, as exemplified by the statements of such men as Osgoode, of Boston, and Ghormley, of the Mayo Clinic. This does not mean that foci of infection are to be disregarded. The rule to follow is to remove an infected site if it is thought that such an operation will benefit the general condition. Cases are reported of almost miraculous cures following tonsillectomy. Now, chronic infective arthritis is noted for its tendency towards spontaneous remissions. Again, it is possible that without the tonsillectomy a week's rest in bed would have accomplished the same result, as for a strain. Finally, it is not always reported that a complete investigation had been made. If the basis of the lesion is a congenital anomaly recurrence is bound to complicate the picture. One must at least be sure of the diagnosis before pronouncing a cure.

Metabolic and senescent forms of low back pain are characterized by hypertrophic changes which, as we have seen, may be of a traumatic nature, and by osteoporosis frequently accompanied by pathological fracture. Deformities following the adult type of rickets (osteomalacia) are not frequently seen on this continent. This whole group is readily recognized by roentgenography.

The sixth group of causes bringing about sciatica and low back pain concerns congenital anomalies. On account of their frequency it is important to stress this type. The longest known is spina bifida. This anomaly may vary from a complete absence of the spinous processes along whole sacral and lumbar segments to a mere fissure in the spine of a single vertebra. The signs and symptoms may vary from a total paraplegia with urinary and fæcal incontinence to a complete absence of disability. In between, cases are occasionally seen with low back pain and pain referred down the sciatic nerve. It is well to remember that, in the case of a mere fissure of a spinous process, the explanation of the pain may not be obvious. Other congenital anomalies may be present. This is the group we shall now study. They comprise the extremely frequent sacralizations. Many authors in recent years have devoted a great deal of energy to studying this condition by x-ray and by dissection. Archer O'Reilly,[11] of St. Louis, has for many years written on the subject. He has recognized so many anomalies of the fifth lumbar vertebra that he says it is difficult to determine what is a normal fifth lumbar vertebra. In a recent study of 100 x-rays taken indiscriminately from orthopædic and medical services he was able to find 33 per cent which showed some variation. The most frequent abnormality was a sacralized transverse process, forming 13 per cent of the total. In France, Weil and Van Dam[14] made an important contribution to the subject. They cite the work of Clarke, who found 39 anomalies in 111 patients suffering from the so-called lumbago. In their own work a study of a large series of x-rays of patients not necessarily complaining of back pain showed anomalies in 3 to 5 per cent of cases. Benassi in dissections of 410 cadavers found 3.5 per cent with a sixth lumbar vertebra. Fisher in a study of 1,637 spines found anomalies of the last lumbar vertebra in 3.6 per cent.

All these statistics are an indication that the evolution of this segment of the spine in man is not yet complete. In quadrupeds the occurrence of anomalies of the last lumbar vertebra is rare, in fact their existence is even doubted. The anomalies begin to appear in the anthropoids. The Royal College of Surgeons of London has a series of 12 chimpanzee skeletons 7 of which have sacralizations. The conclusion is that man is not yet adapted to the standing position. Apparent-

ly, the great frequency of sacralization of the fifth lumbar vertebra means that human beings are trying to diminish the number of lumbar vertebræ or to increase the vertical length of the sacrum. The transitions taking place, usually in the transverse processes, are readily seen on x-ray. Normally the processes of the fifth lumbar are described as stubby and shorter than those of the fourth; in fact, contrary to the other transverse processes, their bases spread on to the body of the vertebra (Gray). Cases showing sacralization present long processes, often wide and wing-like. Though not in the same coronal plane as the anterior part of the ilium they may be large enough to form either a continuous or an intermittent contact. These anomalies would be only of scientific interest were it not for the fact that they are a frequent source of pain, both local and referred down the sciatic nerve.

In early life a new joint may be formed between the long process and the sacrum or the ilium; eventually with wear and tear and with the onset of the degenerative changes which always occur in this type of joint, pain appears. An acute attack may be brought about by a twisting motion as in the golf swing or by some stress with the spine in flexion or hyperextension. The pathogenesis here is similar to that mentioned under lumbo-sacral strain. This syndrome is seen in muscular youths, but a decrease in strength and the production of a lordosis, if one is not already present, are potent factors in accentuating the troubles due to congenital malformation.

The articular facets contribute the third group of anomalies. They are difficult to show by x-ray on account of the forward tilt of the sacrum. Normally the articular facets of the lumbar region are in a sagittal plane, but the lumbo-sacral facets are frequently turned so that the planes of the two joints, instead of being parallel, form an acute angle with the apex forward. This tropism has been found by Miltner and Lowendorf[8] in 70 per cent of 200 cases. This anomaly also increases the number of those suffering from low back pain. It is best visualized on oblique x-rays.

Spondylolisthesis is said by some to be of traumatic origin, but cases are seen in which no such history is obtainable. Clinically, this condition may be recognized by a peculiar type of lordosis. The spine is carried forward but the muscles stay in position, forming double bow strings across the lordotic arch. Between them is a deep furrow. Transverse lines may be seen in the skin of the lumbar region. To make a positive roentgen diagnosis, the rays must be centred directly on the fifth lumbar, and on the film the iliac crests must be in perfect superposition. This will permit a better appreciation of the forward subluxation of the fifth lumbar body on the sacrum. At the same time a solution in the continuity of the vertebral arch (spondylolysis) may be seen.

The treatment of the painful congenital anomalies consists in the elimination of motion. Conservative methods consist in corsets, braces, muscular development. These usually fail and the most effective method of operative treatment is lumbo-sacral fusion. Resection of the offending transverse process has been advocated and performed, but it is a very tedious and bloody procedure, rendered more difficult by the fact that at operation one cannot be sure of having removed the whole process on account of its great thickness. X-rays taken after an apparently successful transversectomy have shown what looked like a second deeper transverse process.

The important neurological condition which may and does exactly simulate other types of sciatica is tumour of the spinal cord, considered here to complete the differential diagnosis. Suffice it to say that tumours in the cord or pressing on nerve trunks, as in the pelvis, present intractable pain with no intermittency. In the case of slowly growing tumours the period of development of symptoms until an exact diagnosis is established may be extremely long, dating from 3 to 12 years. If the lesion is destructive there are no regressions of other signs such as paralysis and loss of sensation. In trauma and infection the pain may not be so severe, and is most often characterized by its intermittency.

It is frequently necessary to look elsewhere for causes of low back pain and even of sciatica. The former symptom is frequently seen in influenza. Pelvic disease may be the culprit; the removal of fibromata and the cure of prolapse have often relieved back pain. Numerous conditions of the urinary system, such as renal ptosis and cancer of the prostate, and of the lower intestinal tract, such as constipation, hæmorrhoids, fistula in ano are frequently blamed.

PHYSICAL EXAMINATION

The patient, with as little clothes on as possible, is to be examined standing and lying down. Look and feel for deformities. Note whether the musculature is underdeveloped or rigid in spasm. Movements may be painful, limited or accomplished with difficulty. Stretching the sciatic nerve (Lasègue test) by flexing the thigh with the knee in extension is informative. Pressure on the crests may reveal pain in a sacro-iliac joint. This is confirmed by the Gaenslen test. Passively hyperextend the thigh of the affected side while the patient holds the other thigh tightly against the abdomen. With the patient on his stomach and well relaxed, palpation of the back and percussion of the bony prominences are carried out. Percussion may be done with a soft percussion hammer or with the closed fist, the blow being delivered by the soft hypothenar eminence.

TREATMENT

We are now in a position to review some other treatments advised and to summarize a line of conservative treatment. Relief from sciatic pain has been obtained by means of epidural injections of saline into the sacral canal. If this method is recognized as a symptomatic treatment it may be used as an adjunct to conservative measures. Local infiltrations of the lumbosacral joints and intervertebral foramina and of the sciatic nerve at the greater sciatic foramen with 1:200 novocaine may be used, with the same reservation. Other types are those advocated by Ober[10] and Freiberg—fasciotomy to diminish tension of the fascia lata and stripping of the gluteal muscles off the ilium to diminish muscular spasm. These operations are supposed to relieve pressure on the sciatic nerve. In the articles of neither of these authors did I see that their cases were investigated in the way this paper advocates. They publish good results, but it may be that they are relieving the patient of the secondary results arising from long-continued sciatic pain. It is a matter of record that two of the patients who were temporarily relieved by the Ober fasciotomy were, at a subsequent operation found to have ruptured intervertebral discs. Manipulations have been and are still being used. This is the only method the application of which may cause an immediate disaster in the shape of a paraplegia. It is therefore to be used only when a positive diagnosis makes its employment innocuous.

To help to decide whether or not to undertake a conservative course of treatment, I would suggest dividing the possible lesions into two groups. Eliminate primary lesions of the nerve, disturbances in neighbouring systems, lesions destructive of bone and nerve or cord, *e.g.*, trauma, disc rupture, syphilis, tuberculosis, tumour; the remainder, strains, infectious arthritis, old injuries, metabolic disturbances, disc lesions without nerve signs, congenital anomalies can be treated conservatively. Rest of the painful part is the first consideration. A few days in bed on a firm mattress with a lumbar support may be sufficient. At first a plaster corset or even a spica taking in the limb affected with sciatica may be necessary. Applying heat locally often gives great comfort. As the acute phase passes more liberty is permitted and an adhesive strapping or a Taylor brace is carried to give support during fatiguing hours. But the brace may not be tolerated if it presses on a tender sciatic nerve. With the resumption of activity the exercises are started, helped along by heat and massage. Particular attention is paid to the gradual elimination of lordosis. The patient can follow his own progress by trying to flatten his back against a door edge, meanwhile keeping his shoulders back. Patients are instructed to avoid the movements which bring on pain: this is particularly important in sacralizations. Success in this type of treatment demands a great deal of determination on the part of the patient. Since very few are so equipped they frequently end up by requesting a fixation operation.

The literature on this subject is so vast that it is impossible to give credit to all contributors. The following references are those containing important bibliographies.

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CARCINOMA OF THE SIGMOID COLON*

(A RADIOLOGICAL STUDY)

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THE sigmoid, because of its wide variation of position and anatomical types and the multiplicity of pathological processes by which it may be affected, remains a difficult field of radiological investigation and, in spite of refinements in technique, sigmoid lesions may still escape visualization, or if visualized their significance may be misinterpreted.

As the methods of examination are the same and the radiological findings similar in the sigmoid to the remainder of the colon, these will be described as applying to the entire large bowel with emphasis on the sigmoid, while the statistical data presented will relate only to the sigmoid flexure. The study does not include cancer of the rectum for while this condition may occasionally or even frequently be shown by x-ray examination, it is equally true that moderately large rectal cancers may escape visualization by radiological methods. In view of the ease with which these lesions may be felt by digital examination or seen by sigmoidoscope, the onus of the diagnosis of carcinoma of the rectum must rest on the clinician and not on the radiologist. It should not be necessary to state that every patient should have a digital rectal examination done before having a barium enema, and in every case in which carcinoma of the colon is suspected he should have a sigmoidoscopic examination if the radiological examination fails to show a lesion to explain his symptoms.

It will be seen from this that sigmoidoscopic and radiological examinations should be considered as supplementary to each other; indeed they may be done satisfactorily with one preparation of the patient, the sigmoidoscopic examination preceding the barium enema. In this regard the time interval between the sigmoidoscopic examination and the proper barium enema examination must vary with the amount of sedative given to the patient. If the sigmoidoscopic examination is done following a heavy dose of sedative, particularly of the morphine group, an interval of two to three hours at least should elapse before attempting to give the barium enema. If a general anæsthetic be used for sigmoidoscopic examination six to eight hours should elapse before giving the barium enema. Sedatives and general anæsthesia both cause temporary atony and a marked decrease in the contractility of the colon, so that, while one may obtain a very good view of the barium-filled colon, the patient, if examined too soon after the sedative or general anæsthetic, will be unable to expel the enema. Thus the post-evacuation examination, which is probably the most important part of the investigation, will be of little value, and the radiological examination will have to be repeated.

METHODS OF EXAMINATION

The procedures at our disposal for examination of the large bowel have been so frequently discussed that only brief mention of them need be made at this time.

1. Plain films of the abdomen in the prone, recumbent, erect, or horizontal lateral directions are of more value in small bowel than in large bowel obstruction, and frequently must be followed by a barium enema to differentiate between large and small bowel obstruction.

2. Barium enema.—Fluoroscopic examination of the abdomen during administration of the barium, preferably with spot films of selected areas, followed by large films in the postero-anterior and right-oblique directions and similar fluoroscopy and films after the patient has expelled as much of the enema as possible, is the

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standard and primary procedure in the radiological investigation of the colon. The value of the post-evacuation examination can hardly be overestimated, and in most cases gives more valuable information than the "filled colon" films. The visualization of a normal mucosal relief pattern in a given segment of bowel at once dismisses carcinoma from the differential diagnosis.

3. Double contrast enema or injection of air per rectum after the patient has expelled practically all of a barium enema is particularly useful in demonstrating the outline of the mucous membrane in the expanded colon and in the visualization of colonic polypi. Fischer[1] is credited with the introduction of this method of examination, which has been popularized on this continent by the work of Weber,[2] Gershon-Cohen and Shay,[3, 4] and others. It is a method requiring considerable time and patience, and there are numerous pitfalls in the interpretation of results, but in selected cases it is of great value.

4. The barium meal may occasionally reveal the presence of a large bowel carcinoma, but, on the whole, this procedure is of greater use in studying the function of the colon than in demonstrating organic disease. In cases of suspected carcinoma it should be reserved for that small group of cases which for some reason, probably ball-valve action of tumour, presents complete obstruction to the enema flow but little or no clinical obstruction. In these cases the fed meal may be supplemented by a barium enema to visualize the lesion between the head of the barium column from the meal above and the head of the enema column below.

Patients in whom carcinoma of the colon is found by radiological examination fall into three main groups: (*a*) Those in whom carcinoma of the gastro-intestinal tract is suspected because of the general symptoms of weakness and loss of weight, with or without some constipation or diarrhœa. (*b*) Those with intestinal hæmor-

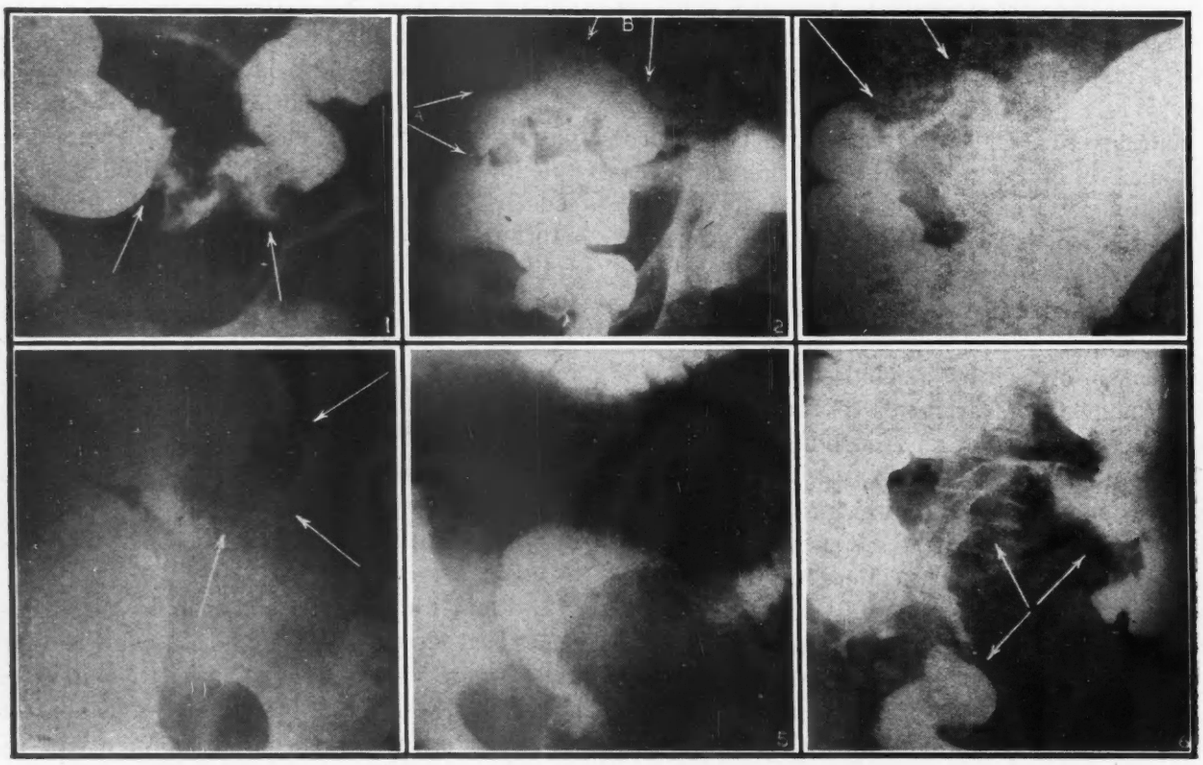

Fig. 1.—Typical polypoid carcinoma of sigmoid. Note defect caused by projection of carcinomatous masses into the lumen of the bowel and distortion of mucosal relief pattern. **Fig. 2.**—Long carcinoma of the sigmoid in a young patient. Note a large abscess pocket at "B" communicating with the lumen of the sigmoid in the carcinomatous area. **Fig. 3.**—Scirrhous carcinoma of the sigmoid. Note relatively short annular lesion, everted margins, centrally-placed lumen, and relatively smooth calibre. **Fig. 4.**—Carcinoma of sigmoid with complete obstruction to the enema flow. Note that the barium has not entered the lumen in the carcinomatous area but simply outlines the lower convex border of the carcinoma. **Fig. 5.**—Diverticulitis of sigmoid with peri-diverticular abscess, stage 3. Differentiated from carcinoma by the preservation of some mucosal relief pattern, length of the lesion, and absence of overhanging edges. **Fig. 6.**—Involvement of sigmoid from adenocystoma of the ovary. Note long smooth filling-defect in sigmoid, preservation of mucosal relief pattern, and absence of overhanging edges.

rhage. (*c*) Those with intestinal obstruction or perforation.

As patients in groups (*b*) and (*c*), namely, those with hæmorrhage and obstruction, require different preparation from those in group (*a*), it seems advisable to describe the groups and their preparation separately. Preparation of the patient's colon for radiological examination is of great importance, as faulty preparation is responsible for a very considerable number of errors, both in the failure to visualize lesions and in the production of false filling defects.

(*a*) The first and largest group includes those cases in which the history is indefinite or atypical, the patients complaining of loss of weight or strength, with or without macroscopic blood in the stool, and with or without some increasing constipation. This group will also include those cases in which clinically unsuspected carcinoma is found, the examination having been done for some other reason. In certain cases in this group the history will suggest a gastric carcinoma rather than one in the colon, and it is always wise to have a colon examination done in cases where gastric cancer is suspected clinically and not found radiologically. The converse of this statement is equally true, as we have not infrequently seen carcinoma of the stomach with a history suggesting a large bowel lesion. One other general statement should be made at this time, and we would like to emphasize the point, that "a negative radiological report in the presence of continued clinical symptoms or signs suggesting gastro-intestinal carcinoma should not be accepted for a period of longer than one month. The examination should then be repeated, both the stomach and the colon being examined if necessary."

In this first uncomplicated group of cases which comprises the large percentage of radiological examinations of the colon, the principle of "having a hollow viscus empty at the time of filling it with a contrast medium" applies, and in the colon this is accomplished by thorough catharsis. We have found castor oil in doses of one or one and one-half ounces the evening prior to examination to be most effective, the patient usually getting a thorough purgation without any residual spasm which renders the administration of the barium enema so distressing to the patient and so troublesome to the examiner. As well as cleansing the colon, one must prevent its refilling from the small bowel, and, to accomplish this, food should be withheld until within three hours of the time the barium enema is to be done.

(*b*) Hæmorrhage.—One must here differentiate between occult blood in the stool and gross hæmorrhage from the bowel. In cases showing only occult blood or even moderate amounts of frank blood the preparation may be carried out by the usual castor oil purge. If large amounts of blood are being passed by stool, it is probably wiser to use preparation by simple enemata until the return flow is free of fæcal content, and then to let the patient wait for at least two to three hours before giving the barium enema. The delay of two to three hours is important in order to allow absorption of retained water from the simple enema which would dilute the barium fluid and might prevent visualization of a lesion which would be readily shown with proper preparation.

(*c*) Obstruction.—This may be broadly interpreted as meaning any abnormal delay in the onward movement of large bowel content. With regard to preparation of the patient for colon examination, this delay may be divided into three stages, namely, (1) increasing constipation, (2) incomplete or threatening complete obstruction, and (3) complete obstruction. The group showing increasing constipation may be prepared in the routine manner by castor-oil purgation, and the group presenting incomplete or almost complete obstruction may well be prepared by simple enemata, as a short period of time is usually available for preparation. In patients presenting complete obstruction for from three to six days, as is unfortunately so often the case, no preparation is required nor indeed is any time available for it. One should proceed to administer a barium enema on the assumption that the colon below the obstruction will be empty and collapsed.

Perforated carcinoma of the colon with general peritonitis is, fortunately, rare, but these cases serve to illustrate a group in which the clinical picture may not differentiate small-bowel from large-bowel obstruction. In these cases, in plain recumbent films of the abdomen, distended coils of small bowel may be seen in step-ladder formation in the central part of the abdomen, with distended colon in the flanks, or fluid levels may be seen in erect films, if these are made. Diagnosis, however, is frequently in doubt from plain films only, and the differential diagnosis must be made by barium enema. The

question of the danger of giving a barium enema in cases of small intestinal obstruction is occasionally raised, but we feel that the information gained in those cases where the differential diagnosis between small and large bowel obstruction cannot be made in any other way more than offsets any danger to be encountered. We have administered barium enemata to many patients with small bowel obstruction, many of whom had marked distension, with no untoward results. In giving barium enemas in cases of incomplete large bowel obstruction it is wise not to use more of the barium fluid than will demonstrate the proximal border of the obstructing lesion, as the patient may not be able to expel the barium proximal to the obstruction.

RADIOLOGICAL FINDINGS

The radiological findings in sigmoid carcinoma will vary with the type of carcinoma and the degree of obstruction present. Two general types of carcinoma are met in the colon, both adenocarcinomata but varying in the amount of tumour proliferation and the degree of fibrous reaction they stimulate. In the first group we have the large fungating or polypoid type which is more common in the right half of the colon and which ulcerates and bleeds; in the second group, the scirrhous or napkin-ring type, which tends to form an annular lesion encircling the gut, which ulcerates late or not at all, which is more common in the left half of the colon, particularly the sigmoid, and which is so prone to produce large-bowel obstruction.

The fungating or polypoid type of carcinoma produces a filling defect by infiltration in the wall of the gut and by projection of carcinomatous masses into the lumen. It frequently involves a long area of bowel, produces distortion and obliteration of mucosal relief pattern, and prevents contraction of the gut (Fig. 1). Ulceration and the formation of peri-sigmoid abscess are more common in this type, and one may occasionally see an abscess pocket communicating with the colon in the carcinomatous area (Fig. 2).

The scirrhous type of carcinoma usually produces a relatively short annular defect, with a markedly narrowed, sometimes tortuous lumen and everted or pouting margins toward the normal lumen above and below. Mucosal relief pattern is destroyed in the area of involvement (Fig. 3).

Not infrequently in sigmoid carcinoma one will meet with complete obstruction to the enema flow, in which even with prolonged pressure it is impossible to force any barium into the lesion (Fig. 4). These cases will usually present clinically complete obstruction, though occasionally a folding of bowel at the site of the lesion may give obstruction to the enema flow in the absence of complete clinical obstruction. While in the majority of cases the lesion causing such obstruction to enema flow will prove to be a carcinoma, unless the lesion itself is visualized one must be content with the statement of "obstruction at a given point". In most of these cases a second barium enema given three to four weeks after cæcostomy will allow a definite diagnosis to be made, as the œdema which was the immediate cause of the complete obstruction will have disappeared and the obstructing lesion will be visualized.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of sigmoid carcinoma involves a wide variety of diseases, but these may be divided into two main groups; (*a*) lesions arising in the sigmoid itself, and (*b*) distortion of the sigmoid due to extra-colonic disease. Of these, the former is the more frequent source of difficulty.

Colonic polypi, because of their tendency to malignant degeneration, may be considered as pre-cancerous lesions, and the finding should be regarded as almost as serious as cancer itself.

In tropical countries many types of colitis occur, but in the north temperate zone the inflammatory lesions commonly to be differentiated from carcinoma of the sigmoid are idiopathic ulcerative colitis and diverticulitis. Ulcerative colitis is usually readily diagnosed by clinical methods, namely, the history, the examination of the stool, and by sigmoidoscopic examination. Radiologically, the picture of intense spasm, the diminution in calibre, and the decrease in the length of the colon, the absence of haustral markings, the presence of multiple ulcers or of pseudo-polypi will indicate idiopathic ulcerative colitis. While clinical methods will usually establish the diagnosis of idiopathic ulcerative colitis, the extent of disease can be established with much greater accuracy by barium enema, with post-evacuation and double contrast examinations.

Diverticulitis with enterospasm, or with early infiltrative changes, offers little difficulty in diagnosis, but in the late state of infiltration or when peri-sigmoid abscess abscess has formed its differential diagnosis from carcinoma may be very difficult (Fig. 5). Diverticulitis is less frequently the cause of blood in the stool and rarely causes complete large bowel obstruction, though both these findings have been observed in this condition. Radiologically, while carcinoma is a more common cause of complete obstruction to the enema flow than diverticulitis, the diagnosis of carcinoma must rest on the findings of loss of expansibility and contractility and complete obliteration of normal mucosal relief pattern, with or without ulceration, aided by the secondary finding that in the sigmoid partial obstruction is usually produced by a relatively short annular or scirrhous type of growth. In diverticulitis loss of expansibility and contractility are less complete; total obliteration of mucosal relief pattern is uncommon, even in later stages; ulceration is rare, and the lesion usually involves a much longer area of gut than does carcinoma. The length of the lesion itself is not an absolute criterion, as occasionally carcinoma may extend over a long area of sigmoid before producing obstruction, and diverticulitis may produce symptoms when the lesion is very short. The presence of diverticula on the bowel above is more in favour of diverticulitis, though one must remember that diverticula may develop proximal to a carcinoma, owing to the partial obstruction caused by the growth.

Deformity of the sigmoid from without may be due to a wide variety of lesions, of which the more common are carcinoma of the cervix uteri or urinary bladder with pelvic extension (Fig. 6), tumours and cysts of the ovary, pelvic cellulitis, and endometriosis. Occasionally a retrograde metastasis in the pouch of Douglas may cause sigmoid deformity. In all these lesions the differentiating point radiologically is the demonstration of contractility of the colonic muscle and a normal mucosal relief pattern. Both these points can be shown best in the post-evacuation examination or by double contrast enema. These extra-colonic lesions usually produce relatively long sigmoid deformities or multiple deformities, whereas carcinoma of the sigmoid, as stated above, usually produces symptoms of partial obstruction when the lesion is still relatively short.

ANALYSIS OF MATERIAL

In a previous communication we[5] reviewed our cases of diverticulitis of the sigmoid seen over the five-year period from January 1, 1932, to December 31, 1936. The present study is the analysis of cases of carcinoma of the sigmoid studied radiologically in this same period of time. The figures are, therefore, suitable for comparison.

During this five-year period we examined by barium enema 6,040 patients, of whom 193, or 3.2 per cent, had carcinoma of the colon from the cæcum to and including the sigmoid, but exclusive of the rectum, and of this group 80, or 1.3 per cent of all cases submitted to colon examination had carcinoma of the sigmoid flexure.

Of these 80 sigmoid cancers, 47, or 59 per cent, occurred in men and 22, or 41 per cent were in women. The youngest patient was nineteen years of age, the oldest eighty-five, the average age being fifty-seven. Three of these eighty cases were in patients under twenty-five years of age. One case in the group presented two primary carcinomas, one in the sigmoid and one in the transverse colon. Three cases of sigmoid carcinoma had evidence of co-existing or pre-existing diverticulitis.

In this group of cases the radiological findings were correct in 76, three cases being incorrectly diagnosed diverticulitis and one mistakenly called "involvement of the colon from without". To these four errors must be added 6 cases in which the radiological diagnosis of carcinoma was proved by the subsequent history to be in error, so that in this series of 80 cases of sigmoid

TABLE I.

COLON EXAMINATIONS IN FIVE-YEAR PERIOD—6,040

Total cases of carcinoma of colon from cæcum to and including sigmoid, exclusive of rectum—193 or 3.2 per cent of all colon examinations done.

Carcinoma of sigmoid—80 or 41 per cent of colonic carcinoma.

	Carcinoma Sigmoid	*Diverticulitis*
Number of cases.	80 or 1.3 per cent of colon examinations done.	All cases 257 or 4.25 per cent. Stages a 2 and 3: 21 or 0.34 per cent.
Youngest patient	19 years	39 years
Average age....	57 years	61 years
Under 25 years..	3	0
Males.....	47 or 59 per cent	145 or 56 per cent
Females.....	33 or 41 per cent	112 or 44 per cent

Accuracy of radiological diagnosis in carcinoma of sigmoid—88 per cent.

carcinoma the radiological findings were correct in 88 per cent of cases.

As diverticulitis of the sigmoid is the lesion most frequently confused with carcinoma, a comparative analysis with diverticulitis in the same period of time was made (Table I). From this comparison it will be seen that diverticulitis, including all cases, is some three times as common as carcinoma of the sigmoid. If, however, we exclude those cases of mild or early diverticulitis in which the radiological findings are readily diagnostic and consider only diverticulitis with infiltration or abscess in which radiological diagnosis is difficult, then carcinoma will be found to be almost three times as common as these types of diverticulitis. In other words, in the case of an infiltrating or partially obstructing sigmoid lesion carcinoma will be found to be the cause three times as frequently as diverticulitis. It is of interest to note the difference in age of the youngest patient with these two lesions. The youngest patient in this series with sigmoid carcinoma was nineteen years, and three were under twenty-five years, while the youngest patient with diverticulitis was thirty-nine years of age. Further, the average age of 80 patients with carcinoma of the sigmoid was fifty-seven years, while the average age for diverticulitis was sixty-one years. From this it will be seen that the fact that a patient with a sigmoid lesion is young does not exclude carcinoma, but on the contrary renders this diagnosis more likely than diverticulitis.

It is of interest that of 80 cases of carcinoma of the sigmoid and 257 cases of diverticulitis, seen in the same period of time, only 3 had radiological evidence of both lesions. We feel, therefore, that diverticulitis is probably not a factor in the production of sigmoid carcinoma, though an obstructing carcinoma may be responsible for the development of diverticula on the colon above it.

The value of repeat examinations was frequently proved in this series of cases, both in the visualization of early lesions and in the differential diagnosis of lesions already visualized. The early symptoms of cancer of the colon and cancer of the stomach are so indefinite and early diagnosis so important that we feel very strongly that both stomach and colon should be examined in this type of case unless the lesion is found in the first area examined.

CONCLUSIONS

1. While radiological investigation has a high degree of accuracy in the diagnosis of carcinoma of the sigmoid this method is not infallible, and a negative radiological report of a colon "or stomach" examination, in the presence of continued suggestive clinical symptoms or signs, should be accepted for only one month. The radiological examination should then be repeated.

2. Carcinoma of the sigmoid has a younger age-incidence than diverticulitis, and a patient under forty with a sigmoid lesion is more likely to be suffering from carcinoma than from diverticulitis.

3. The responsibility for the diagnosis of rectal cancer rests upon the clinician and not upon the radiologist; sigmoidoscopic and radiological examinations should be considered complementary in the diagnosis of carcinoma of the colon.

4. The radiological findings in a series of 80 cases of carcinoma of the sigmoid, seen over a five-year period, are analyzed.

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NICOTINE AND CARDIAC DAMAGE.—Chronic nicotine poisoning in smokers, according to Laessing, results from several factors. Constitution, age, sex, abuse of caffeine and alcohol, debility, and the amount of tobacco consumed are important. Subjective symptoms are vague but reminiscent of cardiac neuroses and angina pectoris. Palpitation, tachycardia, vertigo, headache, and faints may be complained of. There may be pain behind the sternum and alternating feelings of cold and heat. Objective symptoms include bradycardia and tachycardia, changes in rhythm, and extrasystoles. The blood pressure is usually lower than normal. The heart is occasionally enlarged and changes in the electrocardiogram may be observed.—Laessing, F.: *Medizin. Welt.*, 1938, **12**: 1485. Abs. in *Brit. M. J.*

THE ABOLITION OF CLINICAL TUBERCULOSIS BY ANTICIPATION AND CONTROL*

BY WILLIAM OGDEN

in collaboration with

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THE decline in the death rate from tuberculosis, from 160 per 100,000 in 1900 to 36 per 100,000 in 1936, is very encouraging. At the same time it is disquieting to know that this disease is still the leading cause of death between the ages of 15 and 45. It also is discouraging that "in the last twenty years little increase has occurred in the proportion of 'early cases' admitted to sanatoria."[1] Our present method of waiting until people come with complaints before examining or testing makes progress in the early detection of the disease very slow indeed. Only now are we beginning to admit the reason.

> "It was believed that people could be educated . . . to recognize . . . symptoms of early tuberculosis . . . We now know that from two-thirds to nine-tenths of patients with really early tuberculosis have no symptoms, or such vague symptoms that they are naturally ascribed to the ups and downs of ordinary living."[2]
>
> "Important as an informed public and a well trained profession equipped with adequate facilities are for the discovery of tuberculosis, no large proportion of incipient cases will be found so long as we wait for the sick patient to come to his doctor."[1]
>
> "Advance in the early diagnosis of tuberculosis depends upon the recognition of potentially significant lesions in persons who do not complain of symptoms. How can asymptomatic or latent lesions be discovered by x-ray examinations in persons who are presumably in good health? The periodic examination of healthy persons is a costly procedure."[10]

With these facts in mind a plan to follow contacts and normals is presented in this paper in an attempt to detect "pre-clinical tuberculosis",[3, 4] thus reducing the incidence of the disease and at the same time aiding diagnosis in the really minimal stages of those getting through the pre-clinical phase and acquiring actual disease. This work has been carried out at the Toronto Western Hospital Chest Clinic for the past fifteen years. The scheme consists of: a thorough history with particular reference to contact,[4] physical examination, tuberculin test, serological tests,[5] and x-ray where indicated.

Tuberculin test. — All patients received an intracutaneous or Mantoux tuberculin test. The initial injection was 0.05 mg. of Old Tuberculin contained in 0.02 c.c. Any redness and/or œdema, 5 x 5 mm. or over, was considered positive. All tests considered negative were repeated with 1.0 mg. of Old Tuberculin contained in 0.1 c.c. and not considered positive unless a reaction 5 x 5 mm. or over resulted. The tuberculin employed was standardized against the International Standard Old Tuberculin as distributed by the Health Section of the League of Nations.

The tuberculin test was repeated usually in six months on those who did not react previously, and the initial dose of 0.05 mg. was again employed. It has been our experience that unless a tuberculin test is repeated within a month on a negative reactor the initial dose of 0.05 mg. or less should be used. The use of 1.0 mg. as first dose on retesting may occasion too severe a reaction.

Serological tests.—All patients with a positive tuberculin test were investigated serologically. The tests were carried out monthly for three to five tests, and if negative the interval was extended to six months. The serological tests that are routinely carried out are the tuberculo-complement-fixation (T.C.F.) and the Caulfeild inhibitive reaction. These reactions have been described elsewhere.[5] For these tests blood is obtained as for the Wassermann reaction, and is delivered to the laboratory the same day. Positive, questionable, and negative serial serological graphs are shown and described elsewhere[6] with chest x-ray pictures of the cases. Since then the terminology used in reporting the reactions has been changed to that commonly accepted for the Wassermann test, namely, from 4 plus down to 1 plus, doubtful, and negative.

* Owing to lack of space this article has been greatly abbreviated.

† Radiologist.

‡ Members of the staff of the Toronto Western Hospital Chest Clinic.

Heretofore, without these tests we had no means of discriminating amongst the contacts unless or until they showed positive sputum, positive x-ray, symptoms or signs, and then actual disease is present and it is too late for prevention. No other test will specifically anticipate tuberculous disease. "Clinical tuberculosis became demonstrable at some time after the initial observation in 43 per cent of individuals who gave a positive or questionable serological graph. It was also found that no case developed tuberculosis without warning of this being afforded by the preceding serological results."[6] The appreciation of a pre-tuberculosis stage, detected only by blood-serum reactions such as the inhibitive and T.C.F., is not a new conception, having been advocated by one of us as early as 1911.[7] Further, "All our colleagues who have had adequate and intimate knowledge furnished through the use of the dual serial tests have come to rely upon them."[6]

ADVICE GIVEN TO TUBERCULIN POSITIVE INDIVIDUALS WITH SIGNIFICANT SEROLOGICAL FINDINGS

There are two points which are made paramount in the advice given to these persons; first, to avoid further constant or frequent fatigue,[8] and, secondly, to get sufficient and proper food. It is necessary to go into the detail of the daily and weekly routine regarding hours spent at work and at play. The keeping of late hours is discouraged. Most folk cannot stand more than one night a week out till one o'clock and carry on full day work at the same time without undue fatigue. Work, relaxation, recreation and rest must all be provided for and balanced. In the presence of incentive, so common today in competitive work or play, true fatigue of body or body cell and lagging of physiological function frequently exist unrecognized by the prospective patient for months or years. Constant or undue physical, climatic, mental and emotional stress, tension or shock are to be avoided. In the case of those with seven or eight hours a day of work it may only be necessary to restrict their running about in their off hours. With those whose work is difficult it may be necessary to recommend spending Sundays in bed. The factor of mental exhaustion or worry is also inquired into; this can mean more than physical fatigue. The changes or corrections which are prescribed are written out for the guidance of the patient. The quality and quantity of food and the time taken at meals must be noted. At times it is necessary to advise strict adherence to the intake of a well-balanced diet.

Should serological tests more frequently repeated become more rather than less alarming under the above regimen, a full month's rest may be necessary. If this required month's rest —three-quarters of a day in bed—is impossible, stereoscopic films of the chest should be taken every six or even every three months. If the individual is not enjoying good health and if serological reactions and roentgen films are all negative he should be referred to the general medical clinic.

THE RESULTS OF APPLICATION OF THE ABOVE METHODS

Over a period of 15 years a total of 1,300 known contacts, tuberculin-positive, and 400 normals, have been under observation. Of those who followed our prescribed scheme not one has developed tuberculosis. When the contact series includes those whose observation was irregular, only 4.15 per cent (54 out of 1,301) of the total did develop the disease. The incidence in other contact series ranges from 10 to 40 per cent, averaging 20 to 25 per cent.[9, 10] Even when the normal series includes those the observation of whom was irregular not one of the 400 acquired the disease. The incidence among normals in the Framingham survey was 1 to 2 per cent. An example is herewith given which illustrates one type of serological warning.

Mrs. Lat. An example of a 3-plus fixation with the first specimen tested in January, 1925, plainly suggesting biological and potential clinical tuberculosis. This suggestion was strengthened to a warning by a move of two points downward (whether upward or downward matters less than the move itself) in May, 1925. This warning was made stronger by a move upward to 3-plus in the third test, October, 1925. The contact was the wife of a sputum-positive case discovered in January 1925. The warning was not heeded. An x-ray film made in May 1925, showed no lesion, and again in November, no lesion, while in May, 1926, a lesion was demonstrated, covering most of the first and second left anterior intercostal spaces. (This shadow entirely disappeared in sixteen months with bed rest.) The serological chart and the second and third films are reproduced herewith.

May we speculate here? If serological investigation should be added to the armamentarium already employed in the various chest clinics, the incidence of tuberculous disease amongst contacts can, with the same pertinacity as exercised in our own group, be reduced to the same one-

fifth, commencing twelve months hence and onwards. This four-fifths reduction, be it remembered, is allowing for the frequently found human element of *laissez-faire* which we encountered in our series. Taking into account that only some 25 per cent of all sanatorium patients know of a definite intimate exposure, what fraction of Ontario's annual two million dollar hospitalization bill for tuberculosis could we save?

If semi-annual serological testing were also applied to *all* tuberculin-positive normals (described below), would it be too optimistic to believe that in ten years' time we might visualize the vanishing point of tuberculosis in Ontario?

NAME MRS. LAT. T.W.H. CLINIC

MONTH	1	5	10			5	
YEAR	/25	/25	/25			/26	
4++						LESION DEMONSTRABLE BY X-RAY, NO SYMPTOMS REPORTED.	
4+							
3+	X		X				
2+							
1+		X					
?	O—O—O						
NEG.							

O—O = INHIBITIVE

X—X = FIXATION

CONTACT - SEPT. 1924 TO JAN. 1925 - HUSBAND

Chart 1.—The positive fixation on first testing, particularly when followed by a definitely moving graph, plainly warned of potential disease seven and twelve months before it was demonstrable by roentgen film or definite physical signs or symptoms.

THE TESTING OF NORMALS NOT KNOWN TO BE CONTACTS

Thus far in this paper we have been dealing only with persons known to have been exposed to tuberculous infection, in other words, a "contact group". To bring all and sundry under observation with this contact group only two procedures are needed, described as follows:

1. All normals are tuberculin skin-tested semi-annually. As long as they remain tuberculin-negative (and not exposed) they are not in any immediate danger of developing the disease.

2. If they become tuberculin-positive they are then classed as contacts, as they must needs have been exposed, and they are now potential cases of tuberculosis. These are then tested serologically, observed periodically, and advised as described previously for contacts. In this way parents

Fig. 1

Fig. 2

Fig. 1.—Mrs. L., November, 1925. Clear chest film ten months after first serological warning when husband was diagnosed and went to sanatorium; six months after second and stronger warning, but seven months before the lesion was demonstrated by x-ray film. (View taken from behind). **Fig. 2.**—Mrs. L., May, 1926. Showing a definite parenchymal lesion in left upper sixteen months after she was first warned by positive blood tests of the likelihood of tuberculosis developing if she did not take greater care of herself. (Anterior view).

can be advised that tuberculosis has been added to the list of preventable communicable diseases —smallpox, typhoid and diphtheria, not by vaccinating, as in these three diseases, but by being informed as to when infection has taken place, and then providing additional observation and hygienic care as just mentioned.

Five of our clinical group (A, C, G, K, O) have been periodically observing in this way some 400 normals in fifteen years. They are composed of four different series, *viz.*, medical students (C), women university students (G), normals in general practice (O), and nurses in training (A, K, O). Generally speaking, some 50 per cent were negative to tuberculin at the beginning of observation, and most of these became positive during observation. Not one of those who were regularly observed has developed clinical tuberculosis.

The work most productive of concrete results so far has been the periodic observation since 1932 of the pupils in our school for nurses by three of us, above mentioned. This subject has been recently reported upon by Grace A. Thomas,[11] head nurse in charge of the work. In the five years after 1932, with an average of 100 pupil nurses, when the above plan was followed, no tuberculous disease developed in our School of Nursing, as shown by annual x-ray films. Only in the sixth year, when the plan was not strictly followed, did any case of tuberculosis develop. In this year the two guiding clinicians were confronted with such an unusually large number of serological graphs portending danger that they feared, because of economic pressure, to act upon their convictions.

It has thus been shown that in this hospital School for Nurses we do not wait for an annual x-ray film to demonstrate a lesion in its early stage, when, of course, it is too late for prevention. We are anticipating disease by biological tests and precluding it by extra hygienic care.

We know that a positive tuberculin skin test signifies that tuberculous infection has taken place. If, months or years later, symptoms appear or x-ray films demonstrate a lesion disease has already developed. Are there any means by which we may be informed of such serious transition from infection to disease before it actually happens? We believe that serial serological tests indicate that the infection is no longer dormant and that a transitional stage has been reached which, if unrecognized and untreated, will lead to active clinical tuberculosis clearly demonstrable by routine methods.

SUMMARY

1. A simple scheme of semi-annual testing of the population with tuberculin and serological tests is presented.

2. Known tuberculosis contacts should be tested, first by tuberculin, then, if they are positive, this should be followed by serial serological examination.

3. All normals not known to be contacts should be tested, because exposure and infection frequently take place without contact being known. When they are tuberculin-positive they are then serologically tested as contacts, because such they must have been.

4. Serological tests differentiate between those who are liable to develop tuberculosis and those who are not. Those thus found to be liable to develop tuberculous disease are advised to restrict the undue expenditure of energy, to take additional rest if needed, and to take full and scientifically balanced meals.

5. The scheme has been in practical use, as given, for fifteen years in a general hospital out patient chest clinic, with attendances formerly of 2,000 and latterly of 6,000 annually.

6. Ten physicians of the clinic staff acknowledge frequent aid in anticipating tuberculous disease by positive serological reactions or positive graphs, months and years before evidence of the disease by physical, roentgenological or sputum examination would and did otherwise occur, that is, without the advised care.

7. Applying this to the guidance of the particular contacts giving such positive findings, none who took advice developed the disease.

8. In an observed and largely controlled series of 1,300 contacts in 15 years the incidence of tuberculous disease was 4 per cent compared with the usual 20 per cent in uncontrolled series.

9. In an observed and largely controlled series of 400 normals the incidence of tuberculosis was nil.

10. The number of dual tests done to date totals 42,000, and the number of different patients tested is 15,000.

The authors desire to express their appreciation to the hospital officials for their active interest in providing laboratory facilities. Although this might fairly be considered a public health responsibility, these officials stepped in at a time when this work was threatened with discontinuance and public health departments were not ready to lend their support. In addition we would like

to record the assistance of Milton H. Brown, A. H. W. Caulfeild, and Margaret Thompson in synopsizing the data for publication.

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A CASE OF DIABETES MELLITUS WITH MARKED HYPERCHOLESTEROLÆMIA AND SIGNS SIMULATING CEREBRAL THROMBOSIS*

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HIGH concentrations of cholesterol in the blood plasma are not uncommon in diabetes; in fact, hypercholesterolæmia is one of the characteristics of the disease, though its incidence is rapidly decreasing with the more liberal use of carbohydrates. It is also a well known fact that the atheromatous type of vascular lesion is common amongst diabetics and that lipoid infiltration of the intima is a characteristic of this type of lesion. A review of the literature[1] shows that the affected blood vessels in such cases may contain many more times the normal amount of cholesterol and its esters, and that the deposit of these lipoids may at times be such as to almost completely obliterate the smaller vessels is suggested from the case reported by Cullinan and Graham.[2] The following case is, therefore, of interest, since the clinical signs and the laboratory data suggest that the vascular occlusion was due, to a large extent at least, to the deposition of cholesterol.

CASE REPORT

A female, aged 52 years, was admitted to the Private Patients' Pavilion of the Montreal General Hospital, on November 12, 1937, with signs and symptoms suggestive of cerebral thrombosis.

She had been apparently perfectly well until 1930, when it was first noticed that she had an increase of blood pressure. Sugar was first discovered in the urine in 1933. The glycosuria then was transient; it disappeared without any treatment, and, except for occasional headaches, she was apparently well until the onset of the present illness in September, 1937.

On September 20, 1937, she first noticed "numbness in the right arm with a sensation of heat and itchiness". A few days later the numbness and itchiness spread to the right side of the face and then over the whole right half of the body. The condition improved after about a week, but returned a few days later accompanied by "attacks of giddiness". In November she noticed some difficulty with her speech and also loss of taste ("salt and sugar tasted alike"). The family also noticed that she had become talkative.

On admission the physical findings were essentially negative, except for the hypertension and the neurological disturbance—weakness of the entire right half of the body but no definite paralysis. Neurological signs difficult to explain were (*a*) weakness of the left hand; (*b*) loss of sensation of taste on *both* sides of the tongue; and (*c*) numbness and tingling in the small finger of the left hand. These findings, which suggested a widely-scattered vascular disturbance, will be referred to again in the discussion of the clinical course and the laboratory data following treatment.

The diabetes was mild; there was no thirst, polyuria, loss of weight, etc., and, though the urine contained sugar, it was free of acetone bodies, and the blood sugar in the fasting state was 0.2 per cent. The striking laboratory finding was the very high concentration of cholesterol in the plasma, namely, 0.98 per cent. Aside from the cholesterol, there was no lipæmia; the total fat content of the blood, independent of the cholesterol, was 0.74 per cent.

Because of the known ability of the high-carbohydrate low-calorie diet to lower the blood cholesterol rapidly[3] it was decided to institute treatment with this diet immediately and, if possible, hasten the action with protamine zinc insulin. In view, however, of the mildness of the diabetes and the possibility of aggravating the thrombosis by an hyperglycæmic reaction the "ladder" method of treatment was not attempted. She was given, approximately, 250 grams of carbohydrate, 45 grams of fat, and 100 grams of protein, and, with this diet, 30 units of protamine zinc insulin once a day. The effects of this treatment upon the blood cholesterol are graphically recorded in the accompanying chart.

It will be noted that the plasma cholesterol was rapidly reduced from 0.980 per cent to the perfectly normal level within three weeks. Equally striking was the improvement clinically; within ten days all of the abnormal neurological signs had disappeared entirely, and she was discharged from the hospital on December 7, 1937. At an examination a week later (December 14th), the cholesterol was 0.208 per cent; four weeks later (January 5th) it was 0.166 per cent, and on February 2nd, after another four weeks, it was 0.154 per cent. The insulin was then discontinued. The following week (February 9th) the plasma cholesterol was actually lower than the generally accepted level of normality, namely, 0.141 per cent. The data since then are irrelevant; except for the hypertension which has persisted, she is well. On December 6, 1938—one year after discharge from the hospital—the urine was free of

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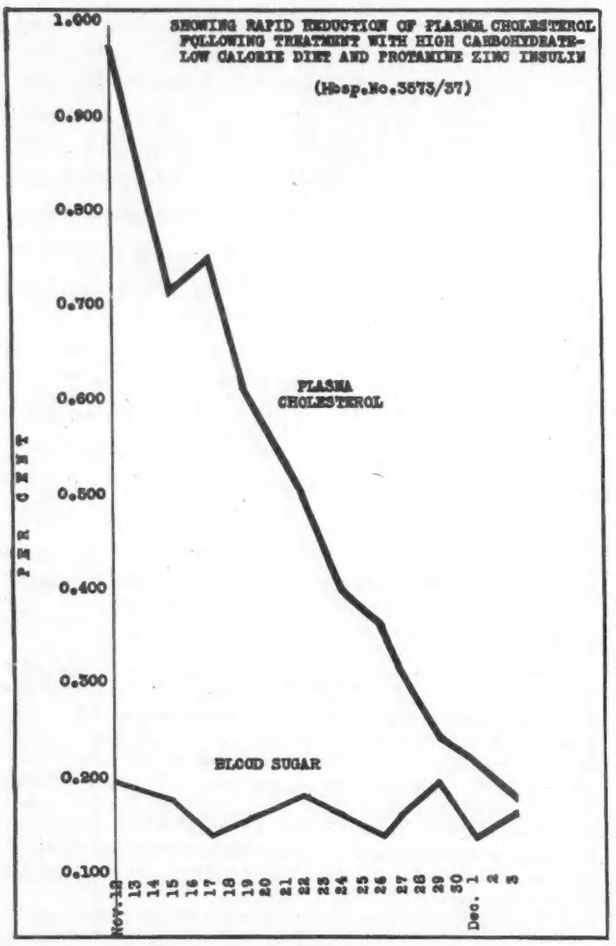

Chart 1.

sugar and acetone bodies, and the blood sugar, in the fasting state, was slightly hyperglycæmic only. The cholesterol concentration of the blood plasma was 0.123 per cent. As stated, she has had no insulin since February 3rd.

DISCUSSION

Extremely high cholesterol values are rare even amongst diabetics. Cholesterol determination has been a routine in this Clinic since 1924,[4] and, in 15,000 tests, values approaching or greater than 1 per cent have been met with six times only. In the case reported here it was noted that the cholesterol on admission was 0.980 per cent. More important, here, however, is the change which occurred in the clinical condition of the patient immediately after treatment, and the parallelism between the clinical condition and the laboratory findings.

It is a known fact that rapid recovery is possible following slight thromboses of the cerebral vessels and following hæmorrhage. Opposed also to the view that the vascular occlusion in this case was due to mechanical obstruction by cholesterol is the fact that none of the very high concentrations of cholesterol met with hitherto were associated with vascular disturbances. Joslin[5] reported a value of 1.6 per cent. In the Clinic for Diabetes at the Montreal General Hospital the following values were found without any evidence of vascular occlusion:

Case No.	*Plasma cholesterol (percentage)*
2126/29	0.926
3090/31	1.040
6538/28	1.190
5728/31	1.380
3345/29	1.510

There were no signs of vascular disturbance in the case of marked lipæmia reported by Rabinowitch and Mills with a blood fat of 18.6 per cent[6] nor in another of the writer's cases reported in the *American Journal of Medical Science*,[7] with a blood fat of 11.6 per cent. The case of lipæmia retinalis reported by McKee and Rabinowitch[8] also showed no signs of vascular occlusion, though the blood fat was 9.24 per cent and the cholesterol content was 1.04 per cent. Opposed, however, to cerebral thrombosis was the *rapid and complete disappearance of all of the neurological signs, in spite of their long duration prior to the patient's admission to the hospital;* it is difficult to conceive of a progressive thrombosis of two months' duration with complete recovery within a few days. Suggestive also of accumulation of cholesterol on the walls of blood vessels rather than occlusion due to thrombosis was the *widespread* character of the neurological disturbance, namely, the hemiplegia with involvement of the face on the *same* side, the loss of taste on both sides of the tongue, the weakness of the left hand and the numbness and tingling of the small finger of the left hand.* Also favouring atheromatosis rather than thrombosis was the parallelism between clinical recovery and reduction of the cholesterol content of the blood plasma. When shown these data Dr. Shields Warren, who has had a very wide experience with the pathology of diabetes, also favoured the view that the alteration which occurred in the cerebral circulation was due to atheromatosis rather than to thrombosis. As far as can be ascertained from the literature there are no records comparable to the case reported

* The loss of taste might have been one of the psychic disturbances not infrequently met with in hemiplegics. This would not, however, explain the simultaneous paresis on the whole right half of the body and weakness and numbness and tingling in the left hand. The latter appear to be explainable only by a widely scattered vascular disturbance.

here, with the possible exception of the above-mentioned case of coronary occlusion in a young diabetic reported by Cullinan and Graham.[2] Unfortunately, the cholesterol content of the blood was not determined.

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CHANGING CONDITIONS FOR CÆSAREAN SECTION*

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ABDOMINAL Cæsarean section occupies a unique position in surgery. It is an easy operation; it is very spectacular; but it is the most dangerous of all obstetrical or gynæcological procedures.

In spite of the high morbidity and mortality rates associated with abdominal delivery there has been an increasing tendency to utilize this method of solving almost every obstetrical problem. The surgical-mindedness of the public, stimulated by a similar viewpoint in the nursing and medical professions; the availability of more or less satisfactory operating facilities; the increasing number of doctors doing surgery; the general ignorance of obstetrical manœuvres, and the exorbitant value placed on a living child, possibly due to the falling birth-rate (from 24.3 per 1,000 population in Canada in 1927—to 20.0 in 1936), are all factors predisposing towards delivery by the abdominal route. Stander, Cooke, Harris, Irving, Lynch, Wilson, Bland, Plass, and many others have drawn attention to the widespread abuse of Cæsarean section.

HISTORY

The Lex Regia of Numa Pompilius in 600 B.C. commanded a post-mortem operation on all pregnant women dying undelivered. This law became known as the Lex Cæsarea in the time of the Cæsars, hence the origin of the term Cæsarean section.

In 1500 a Swiss swine-gelder named Nufer is reported to have delivered his wife after a prolonged labour by hysterotomy. There is considerable doubt of the accuracy of this report, for she subsequently had several children, including twins, by natural means, and lived to the age of seventy-seven.

In 1581 François Rousett published a "Treatise on Cæsarean Section", and reported 15 successful cases; at this time operations on the living woman were done only in desperate circumstances. The earliest well-authenticated case was that of Trautman, of Wittenberg, Germany, in 1610, the patient living for twenty-five days. Sutures were not used in the uterine incision until advocated by Lebas in 1769. They were not regularly used until about sixty years ago. The mortality rate was about 85 per cent. The first published case on this continent was done by John Richmond in Ohio in 1827, and in 1871 Harris, of Philadelphia, collected 59 cases with a mortality of 48 per cent. Six years later Porro advised supravaginal hysterectomy after Cæsarean section to diminish this terrible toll. This became known as the "radical Cæsarean section", and in 1882 Sanger devised the "conservative Cæsarean section", the operation we now call the "classical". In 1907 Frank, of Bonn, described an operation which opened the uterus through the lower uterine segment. This was a real advance in obstetrical surgery, and, with various modifications, is rapidly becoming the operation of choice throughout the world.

INCIDENCE

That there is an increasing incidence of Cæsarean section is shown by such papers as those by Plass (1931) and by Stein and Levanthal (1935). There is a considerable variation in different hospitals and in the same hospital from year to year. At the Chicago Lying-In Hospital the incidence of Cæsarean section for 1916-17 was 0.9 per cent; in 1928-29 it had risen to 3.0 per cent; and from 1931-34 it had reached the figure of 5.6 per cent (Daily).

At the Michael Reese Hospital, Chicago, in a ten-year survey from 1922 to 1932 the incidence during the first five years was 0.91 per cent, and for the second half of the period 3.79 per cent. In 1935 Stander, in "Cæsarean Section and its Abuses", reported incidences ranging from 1 to 14.4 per cent at various hospitals. A percentage of 4.8 was found by Gustafson (1937) in an eight-year survey of the William H. Coleman Hospital, Indianapolis. Philpott in a review of Cæsarean sections during the past ten years at the Royal Victoria Maternity Hospital, Montreal, found a gradually increasing incidence from 1.8 per cent in 1927 to 3.3 per cent in each of the

* Read before the Fifty-eighth Annual Meeting of the Ontario Medical Association, Toronto, 1938.

past three years (personal communication). Scott notes a rising incidence at the Burnside Hospital, Toronto, from 1925 to a high of 5.78 per cent in 1929. Since then there has been a fairly steady drop to 1.90 per cent in 1937 (personal communication). Tew, London, Ont., reports 1.7 per cent for the past five years (personal communication). Lynch (1937) collected a total of 524,117 deliveries of which 2.5 per cent were by hysterotomy. About 3 per cent of all women delivered in hospital have their babies by the abdominal route; this represents about 1 per cent of all deliveries (Harris, 1937).

MORTALITY

In the excellent article by Plass (1931), "The relation of forceps and Cæsarean section to maternal and infant mortality", he pointed out that of 4,965 maternal deaths, 531, or 11 per cent, had been delivered through the abdomen; of 370 primiparæ who died, 116, or 31 per cent, had Cæsarean section. He quotes extensive compilations of hospital figures by nine authors; the lowest mortality rate was 4.2 per cent, of the nine only 2 were under 5 per cent, and 4 over 11 per cent, one of which was 16.1 per cent. A report from 138 hospitals of 2,273 sections showed an average mortality rate of 5.9 per cent. Lewis (1926) reported a rate at the Cook County Hospital of 9.4 per cent; Gustafson (1937), previous to 1931, 11.1 per cent; from 1931 to 1936, 4.8 per cent. Lynch in a collection of 12,955 Cæsarean sections found a mortality of 4.1 per cent. He states that one-quarter of the deaths of women with seven months' or more gestation occur following Cæsarean sections. He also makes the startling statement that, "more than half of the deaths following Cæsarean section have occurred in women who previously have borne children through the normal birth passages."

Of maternal deaths the following figures show the percentage who had been delivered by Cæsarean section (Lynch).

		Percentage
New York	1930-32 inclusive,	19.8
Philadelphia	1931-33 "	23.0
San Francisco and bay cities	1932-35 "	31.0
In seven Pacific coast cities	1933-34 "	33.0

Dr. Brooke Bland, in discussing Dr. Lynch's paper in New Orleans, 1932, on "More conservatism in Cæsarean section", said that there had been 65 papers on Cæsarean section mortality since the beginning of the century. He had collected a series of 1,843,356 deliveries, of which 19,480 were Cæsarean sections; of this number 1,269, or 6.5 per cent died. Phaneuf (1931) who has done so much to popularize the transverse cervical section reports a maternal mortality of 5 per cent in 418 cases, and of 3 per cent in 198 transverse cervical operations, even in his very capable hands. These figures leave no doubt that the loss of life of women in their prime from this operation is frightful. What factors are responsible for so many deaths from this procedure which seems so easy?

1. The enormous number being done due to misunderstanding of the necessary indications, an under-valuation of contraindications, or ignorance of other more conservative obstetrical methods of delivery. Many of these operations are performed by the occasional operator.

2. The failure to realize the importance of the time-factor. Wilson (1937) says that the mortality "rises progressively for every hour the patient is in labour before the operation is done, reaching 10 per cent when done late in labour and the prohibitive figure of nearly 30 per cent when done after attempts at delivery from below had been made." Campbell's report of 482 sections on private patients with the excellent mortality of 0.826 per cent tends to confirm this view, as most of his cases were before or in early labour, and many seem unjustified by any ordinary standards. In 76 others there was a mortality rate of 5.3 per cent. These were "referred" cases who had been in labour for some time, probably with some vaginal manipulation.

3. The type of operation. The classical uterine incision is being replaced gradually by utilization of the thin, comparatively avascular, lower uterine segment. Daily, Heffernan, Plass, Gustafson, Wilson, Stevens, Waters, Phaneuf, and many others strongly recommend a more general use of some type of low section as a means of decreasing the fatalities. The Latzko, the Porro, and possibly even the Portes, operations, will still further decrease the danger in those badly infected patients where vaginal delivery is absolutely impossible.

INDICATIONS

Reports of Cæsarean sections have been collected, totalling approximately 5,000 operations. The same general indications, such as cephalopelvic disproportion, placenta prævia, etc., occur throughout, with a group called "miscellaneous" in the accompanying table, which contains a wide

TABLE I.

	Collected Reports	*A*	*B*	*C*	*D*
Cephalo-pelvic disproportion.	2,206 44.6%	186 46.3%	197 47.0%	341 49.3%	402 57.9%
Previous section.....	715 15.2%	29 7.2%	103 24.5%	45 6.5%	96 13.8%
Placenta prævia.....	310 6.6%	30 7.4%	13 3.1%	37 5.3%	53 7.6%
Accidental hæmorrhage..	139 2.9%	21 5.2%	11 2.6%	2 0.3%	37 5.2%
Late toxæmias.	433 9.1%	37 9.2%	23 5.5%	56 8.1%	38 5.2%
Cardiac disease	185 3.9%	22 5.4%	11 2.6%	19 2.7%	23 3.3%
Miscellaneous..	766 12.0%	82 20.4%	60 14.3%	191 27.4%	46 6.6%
Total...	4,694	401	418	691	695

variety of reasons or excuses for operation not coming under one of the general headings. This table has been made up by selecting two pairs of reports which happen to have approximately the same number of operations. It is interesting to note the percentage variation in different reports for the same indication. For example, 15.2 per cent of the total group were done for "previous Cæsarean section", while in "B" we find 24.5 per cent for this reason, and in "C" only 6.5 per cent. Again, in "accidental hæmorrhage", with an average of 2.9 per cent, "A" and "D" each have 5.2 per cent, and "C" only 0.3 per cent.

Does this not mean that reasons considered adequate to justify abdominal delivery at one institution at another would seem quite insufficient? It is obvious that many factors, such as varying incidence of certain pathological states, religious opinions, etc., must account for a considerable divergence of reported indications. It is impossible however, to compare a number of reports without realizing that there is no unanimity of opinion among obstetricians as to really valid reasons for this dangerous procedure.

1. *Disproportion.*—By far the commonest indication for Cæsarean section is cephalo-pelvic disproportion (45 to 50 per cent of all cases) but can we be certain that the pelvis in question will not permit the passage of the particular baby concerned? Nowhere in medicine is there more difficulty in arriving at an accurate decision than in the "border-line" pelvis. Measurements, as ordinarily done, are more often harmful than not. Many a woman has been booked for Cæsarean section on account of small or abnormal measurements who has delivered herself without difficulty before the operation could be done. This is particularly true of women with a history of a previous difficult still-birth delivery. Training oneself to estimate by careful palpation the potentialities of a pelvis is far more important than any manual measurements however carefully done.

The outstanding work of Caldwell and Moloy, of New York, on the variations of pelves and the mechanism of labour, if more widely understood and taught, would save many lives by substituting elective operations for Cæsareans performed late in labour, when the mortality is particularly high. Their "precision stereoscope" gives an opportunity to measure accurately not only the bony pelvis, but also the head which must pass through it. This would eliminate a considerable number of operations by showing beyond reasonable doubt that the child is deliverable from below.

The physiological method of arriving at a conclusion is by a test of labour. Many women are sectioned, supposedly after a test of labour, who have never really been in labour at all. Except in the case of rare affections of the cervix, true labour will always cause effacement and some dilation of that structure. Some obstetricians feel that a real test of labour means strong pains for one or more hours after full dilatation of the cervix has been obtained. To most of us this seems too drastic a criterion. So many mistakes are made in cephalo-pelvic disproportion that we must constantly keep in mind our fallibility.

2. *Previous Cæsarean sections.*—The next most important indication is "previous Cæsarean section". The number actually performed for this reason must vary with different factors, such as the incidence of abnormal pelves, accidental hæmorrhage, and placenta prævia, but the chief factor is the willingness of the obstetrician to permit a trial labour in selected cases. This is shown by a percentage variation in different reports from 6.5 to 27.

Phaneuf states that "pelvic delivery after the low or cervical section, is a rather safe procedure . . .". The old dictum about Cæsarean sections is certainly more true about the classical type. Wilson, Daily, Harris, Waters, and

many others agree that a trial labour under careful supervision is permissible where the indications for the original section are absent and the post-operative course had been normal, particularly if the previous section had been a cervical one.

3. *Placenta prævia.*—Bill collected 2,117 cases of placenta prævia of various types treated chiefly by vaginal delivery with a maternal mortality of 9.68 per cent and a fetal mortality of about 50 per cent. Another series of 262 cases chiefly treated by Cæsarean section showed a maternal mortality of only 1.78 per cent. He reports 104 cases with 82 abdominal deliveries, with 1.92 per cent mortality. Danforth, Gordon, Mackenzie, and Seigel, agree with Bill that Cæsarean section, probably with transfusion, is the treatment of choice in partial or complete placenta prævia. A few writers are rather more conservative in their attitude. In the author's opinion the only concession to conservative treatment which is justified is an examination on the operating table with preparations already made for vaginal delivery (bagging, etc.), or Cæsarean section, as the findings indicate.

Hall *et al.*, McDowell, and Ude and Urner stress the value of x-ray studies of the pelvis with an opaque substance in the bladder in suspected cases of placenta prævia. By this means a satisfactory number may be saved a vaginal examination on the operating table, which must add some risk to abdominal delivery if subsequently performed.

4. *Accidental hæmorrhage.*—There is no more disquieting picture than a case of severe accidental hæmorrhage of late pregnancy; about 3 per cent of sections are done for this indication. The extreme shock, the spastic tender uterus, the distressed fetus, the evidence of some toxæmia, and the apprehension of the patient make immediate activity of a drastic sort seem imperative. The result has been a tendency to resort to Cæsarean section, often even before a transfusion could be given. So high has been the death rate associated with this procedure, even with the Porro type of operation, that thinking obstetricians have been turning more and more to conservative treatment.

In 1931 the late Dr. Polak reported 16 cases of complete abruptio placentæ treated conservatively with one death, and strongly urged a return to vaginal delivery. Since then this viewpoint has been adopted by many authors, Irving, Kellog, Wilson, Smith, Gordon, Holmes, Studdiford, Oxley, Kornfeld, Smith and Taylor.

Recently, Shute and other workers at the University of Western Ontario have produced evidence to show that placental infarction and consequent retro-placental bleeding is decreased by the use of vitamin E, in the form of wheat germ oil. The author believes this is a valuable contribution to the treatment of this alarming condition, and that its more general use will prevent many catastrophies.

5. *Late toxæmias of pregnancy.*—In 1936, 2,235 women died in the United States from "puerperal albuminuria and eclampsia", out of 12,182 deaths associated with pregnancy; excluding those following abortion, we have over 25 per cent of our maternal deaths due to this group of toxæmias. Peckham states that from 10 to 15 per cent of pregnant women will develop one of the late toxæmias, chronic nephritis, pre-eclampsia and eclampsia. Of these about one-third, 3 to 5 per cent, will be left with chronic nephritis, which will be aggravated by a subsequent pregnancy. Although clinically the differences between pre-eclampsia, nephritis, and low-reserve kidney often seem distinct, there are a number of cases which are impossible to classify. The annual reports of the New York Lying-In Hospital from 1933 to 1937 inclusive, show low-reserve kidney 800, chronic nephritis 212, pre-eclampsia 172, eclampsia 35, and the large group of 335 unclassified.

Stander and Peckham found a mortality rate of 42.5 per cent in a ten-year follow-up of chronic nephritis. Each pregnancy in a woman suffering from chronic nephritis, even under the most careful supervision, will have a considerable immediate mortality and will also shorten by several years her life-expectancy. Peckham, with whom Stander and an increasing number agree, says, "Generally speaking, the diagnosis of chronic nephritis should be considered by the conscientious obstetrician as an indication for termination of the pregnancy", and also, ". . . Cæsarean section with hysterectomy or sterilization may best serve the interests of the patient".

The diagnosis of chronic nephritis presumes a damaged kidney prior to the current pregnancy, and usually the condition shows up early; as such it cannot be prevented by prenatal care. Can adequate ante-partum care lessen the chance of chronic nephritis occurring before the next

gestation? That pre-eclampsia and particularly eclampsia leave the patient uninjured for subsequent child-bearing, as formerly thought, has been amply disproved, for 23 per cent of eclamptics show evidence of chronic nephritis during the year following delivery.

The vast majority of these can be prevented by adequate prenatal care. If signs of developing pre-eclamptic toxæmia are recognized early adequate treatment will usually avert serious consequences. Certain patients, however, will do badly in spite of treatment. In these, delivery becomes imperative and can usually be accomplished by some form of induction. Those with fulminating toxæmias, however, may best be delivered by Cæsarean section, but one must not forget that from 20 to 30 per cent of eclampsias occur after the uterus has been emptied, and eclampsia after abdominal delivery has a poorer prognosis than after delivery from below.

When the convulsive state has been reached Cæsarean section should rarely if ever be resorted to, and then only after the convulsions have been under control for some time (Dieckman, Fraser, Harris, Gordon, Kellog, Wilson and Phaneuf). In spite of this generally accepted opinion many sections are still being done for eclampsia. In 1936, in Canada, of 89 women who died following Cæsarean section, 19 were under the classification of "puerperal albuminuria and eclampsia".

6. *Cardiac disease.* — Of medical conditions complicating pregnancy, excluding chronic nephritis, by far the most important is organic disease of the heart; 4 per cent of Cæsarean sections are done for this indication. Demonstrable cardiac enlargement is usual in pregnancy (Eastman). Many pregnant women have functional murmurs, especially in the supine position, and extra-systoles are common. But about 2 per cent of gravid women have organic heart disease (Hamilton, Lamb, Tamis and Clahr) of whom 5 to 10 per cent will die before the puerperal state is over (Eastman).

As Cæsarean section became more popular it was inevitable that abdominal delivery would be employed frequently in pregnant women distressed by heart disease, with the hope that this operation might relieve that failing organ. However, Hamilton ". . . observed that emptying the uterus of a pregnant woman in heart failure did not result in much immediate relief", and Eastman makes the statement that, ". . . in the presence of heart failure delivery by any known method carries with it a maternal mortality of over 50 per cent". A thorough understanding of those two statements will decrease the tendency to surgical delivery in many cardiacs. Women with heart disease frequently have surprisingly easy labours. Even Class 3 patients may often be delivered in bed with very little shock.

During the past ten years hysterotomies for purely cardiac indications are becoming increasingly rare. Fitzgerald reported 126 cases of severely damaged hearts under observation and strict control through 192 pregnancies with no deaths during gestation and labour, and no Cæsarean sections. Many other authors (Frankenthal, Harris, Cooke, Gustafson, Cosgrove, Lamb, Hamilton and Eastman) agree that heart disease, or sterilization on account of it, is not a valid indication for abdominal delivery.

7. *Miscellaneous.*—The impression has been developed in the public and in many doctors that tuberculosis *per se* is a sufficient reason for Cæsarean section. In recent years obstetricians dealing with tuberculous women are becoming more conservative. At the Mountain Sanatorium, Hamilton, we permit vaginal delivery with assistance early in the second stage, except in those cases where a very prolonged labour is expected or definite obstetrical reasons for Cæsarean section exist. Matthews advocates labour with assistance even in breech presentations.

In non-tuberculous patients this and other abnormal presentations are too frequently the excuse for avoiding a tiresome labour, necessitating good obstetrical judgment and skill, by terminating the pregnancy through the abdomen. The same remark is true of elderly primiparæ, most of whom can be delivered more safely from below. Quigley feels that the management of labour in this group is no different than for the young primipara.

In diabetes the situation is rather different. The tendency to "giant fetuses" and intrauterine death, and the difficulty of controlling the patient through the diversities of labour, make abdominal delivery the procedure of choice rather frequently.

Obstructive tumours, carcinoma of the cervix, any condition which makes vaginal delivery extremely unlikely, and ruptured uterus, are, of course, valid reasons for Cæsarean section. Al-

though rupture of the uterus may be due to many conditions other than Cæsarean sections (only 3 out of 12 cases at the Woman's Hospital, New York, had been preceded by Cæsarean section, Seley), the possibility of rupture in a subsequent labour cannot be ignored. The result has been that the more primary sections that are done the more secondary ones will be necessary, or seem to be so.

There are a great variety of circumstances which may arise occasionally which will necessitate hysterotomy in some particular patient, such as certain developmental deformities of the genital structures or pelvis, or local diseases of those parts. Each individual case must be studied with a view to accurately estimating the relative risk of vaginal or abdominal delivery. If that were done no honest surgeon could accept, "The wish of the patient . . ." or many other equally unjustified excuses as indications for Cæsarean section.

Heart disease, eclampsia, abruptio placentæ, and most medical conditions complicating pregnancy are usually best handled by conservative obstetrical means. More careful study and increased judgment will lessen the number of Cæsarean sections for disproportion. Placenta prævia and chronic nephritis should be treated more radically.

CONCLUSION

1. The incidence of Cæsarean sections is increasing alarmingly.

2. Cæsarean section is still the most dangerous of all abdomino-pelvic operations.

3. The nursing and medical professions and the public must realize that abdominal delivery is not the solution for every obstetrical problem.

The author has completed a very extensive list of references. This is omitted for lack of space, but may be obtained from him on application.

HERNIA*

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MY remarks will be confined principally to inguinal and femoral hernia. I cannot discuss the etiology of hernia, more than to state that the theories of the congenital sac and congenitally weak muscular and fascial arrangement receive most consideration at the present time, and this is reflected in the attitude of the Workmen's Compensation Board when the question of trauma arises.

The differentiation between inguinal and femoral hernia is made by deciding whether the swelling appears medial to the pubic spine and above Poupart's ligament, as in the inguinal hernia, or below Poupart's ligament and lateral to the pubic spine, as in femoral hernia. Also in femoral hernia the inguinal canal will be found to be empty.

In deciding if an inguinal hernia is direct or indirect, the oblique direction of descent in the indirect, and the fact that the direct never descends to the bottom of the scrotum are helpful. But the absolute test of feeling on which side of the inferior epigastric artery the opening lies is more theoretical than practical.

The complications of hernia are four, and they often follow one another in sequence, as best exemplified in the umbilical hernia. (1) *Inflammation*, in which the swelling is tender; there may be fever and no signs of obstruction. (2) *Irreducibility*, due to inflammatory adhesions, growth of contents, or strangulation, although the latter form is not always irreducible. (3) *Incarceration.* An incarcerated hernia is one in which there is obstruction to the passage of the contents of the bowel in the sac. It usually occurs in the umbilical hernia, and is a dangerous diagnosis to make as it frequently precedes strangulation. The swelling is of doughy consistency, is not tense or tender, and obstructive signs are present. (4) *Strangulation.* A strangulated hernia is one in which there is interference with the blood supply to the contents of the sac at its neck. It is tense, tender and gives no impulse on coughing. It is not necessarily irreducible and taxis is frequently employed to reduce it, if early. If only one loop in the sac is twisted there may still be an impulse on coughing; but this, by our definition, is not a strangulation of the hernia. The signs of obstruction are pain, vomiting, disten-

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sion and absolute constipation. Of these, pain is the most important, as it will be early, but the others are late signs and not to be waited for. The Richter type of hernia, where strangulation is present but only a portion of the lumen of the bowel, a small knuckle, is in the hernial ring (usually the femoral ring), presents atypical symptoms, and obstruction is not present.

TREATMENT

The truss is only justified in infants and elderly patients, or those unsuitable for surgery. The test of a well-fitting truss is made with the legs wide apart, and the patient bending forward and asked to lift or cough.

In the operative treatment the aim is to remove the sac and to secure a sound abdominal wall, and the steps should always follow in the following order. (1) Expose and identify the sac; the free rounded white edge is the guide to the sac. (2) Free and open the sac. (3) Relieve any constriction if present cutting away from dangerous structures, that is, up and lateral in oblique inguinal hernia (to avoid the inferior epigastric artery), up and medial in femoral (to avoid an aberrant obturator artery). This is followed by gently withdrawing the loops and inspecting the constriction grooves. The proximal constriction groove and the apex of the loop are the two most frequent sites of gangrene. (4) Deal with the contents by reduction, or resection if necessary. (5) Deal with the sac. Resect with or without transplantation of the stump. Be certain the neck of the sac is reached by passing a probe into the peritoneal cavity to ascertain that you are not merely dealing with an offshoot of the main sac. (6) Repair.

There are a number of points in technique which are of the utmost importance to successful operation. The cord should be disturbed as little as possible. In lifting the cord from its bed the transversalis fascia is readily injured, and this is a cause of a subsequent direct hernia. Accordingly, in the child, where simple ligature of the sac will cure, and where no repair is necessary, the cord should not be disturbed from its bed. Do not injure the structures of the cord, as injury to vessels and nerves may cause hydrocele or atrophy of the testicle. The bladder is the most important structure in the operative field and lies on the medial side of the sac in the direct hernia, but is not a factor in the indirect hernia. The bladder may be repaired with no consequence if any injury is recognized, but if an injury is overlooked this may give rise to serious complications. Injury to the ilio-inguinal nerve results in weakening the conjoint tendon, and may give rise to direct hernia or pain. Sutures inserted into Poupart's ligament should not all come in the line of the same fibres as the ligament will split and leave a weakness. The external ring must not be reconstituted too tightly around the cord, as venous obstruction may give rise to a varicocele. Swelling of the leg is a frequent post-operative complication and is to be avoided by preserving the freedom of the femoral vein. A sliding hernia, where cæcum or sigmoid slide down beside the sac extraperitoneally, is a difficult complication to recognize and to deal with, but the most important thing is to avoid injury to the vessels of the mesentery which lies posteriorly. This is a pitfall which often perplexes the occasional operator.

The causes of recurrence after operation may be considered as:

1. *Pre-operative causes.*—Due to poor selection of cases—as untreated, cough, enlarged prostate, constipation, or urethral stricture.

2. *Operative causes.*—(*a*) Failure to remove the sac; this is the commonest cause of recurrence in indirect inguinal hernia. (*b*) Inadequacy of the repair effected; this is usually at the lower angle. In direct inguinal hernia it is failure to close the rent in the transversalis fascia and to adequately support that structure. (*c*) Injury to normal structures during the repair. (*d*) Failure of sutures to maintain the repair that is effected. (*e*) Inadequate hæmostasis, often contributing to infection. (*f*) Too tight suturing, resulting in sutures cutting out.

3. *Post-operative causes of recurrence.*—(*a*) Vomiting; (*b*) inadequate rest.

Probably the most important of these causes (provided that the sac is properly removed) are the poor selection of cases and the failure to maintain the repair that is done.

The high recurrence rate, varying in different reports up to 25 per cent, has led to dissatisfaction with repairs frequently employed and has led some to question the principle of many repairs, including the Bassini, Halstead and others. It is universally agreed that the question of transplantation of the cord, as in the Bassini method, or no, is not important in regard to recurrence.

The most important advances in the treatment of hernia have their background in the work of Gallie and LeMesurier, who demonstrated that muscle sewn to fascia, or even fascia sewn to fascia, unless first scarified and in wide approximation, will unite only by light fibrous strands and will separate again unless the suture material itself will take all of the strain. The living fascial suture is the ideal one to employ, and tension is not necessary as the suture material itself, if woven into a defect, will replace the deficient fascial or muscular planes. This has so revolutionized the treatment that in many centres, as for instance St. Thomas's Hospital in London, only two operative measures are commonly employed. These depend on the age of the patient and the condition of the muscle and fascial structures. In the young patient with undistorted inguinal region and good musculature simple removal of the sac will cure, and suturing only tears and distorts the normal structure. In elderly patients with distorted and weakened muscular and fascial planes, the repairs with absorbable suture, suturing muscle to fascia, or edge of fascia to edge of fascia, will be followed by recurrence and the only efficient repair is by living fascial suture. There is some agreement that fascia is indicated in: (1) direct herniæ; (2) recurrent herniæ; (3) large ventral herniæ; (4) combined direct and indirect herniæ; (5) large scrotal herniæ where the inguinal canal has lost its obliquity.

In pleading for fascial repair in these cases one is at the same time urging ritualistic adherence to the technique perfected by Gallie and LeMesurier, which has proved its merit. The most important suture is the lower angle next the pubic spine, which should pick up the periosteum over the bone and also the edge of the rectus sheath in its grasp.

The silk technique is much discussed at the present time and has definite merit, in that, properly executed, the repair that is effected should be maintained unlike that with absorbable suture. It, however, is inferior to fascia in that approximation of tissues is essential and some strain cannot be avoided, while the fascial repair can dispense with approximation and tension. A silk technique that gives such results as are frequently reported must be faultless, and herein lies one of the weaknesses. Carefully executed, infection may be reduced to a minimum, but carelessly performed it invites disaster.

In direct hernia the essential to repair is the closure of the rent in the transversalis fascia, followed by adequate support, which again is most efficient with fascial suture. In femoral hernia the low approach which bears the name of Lockwood, a vertical incision over the crural canal, has been supplanted by the high or inguinal approach which is called Lotheissen's operation. This affords an approach through the inguinal canal and down in the extraperitoneal tissues to the neck of the sac. It affords better exposure, higher ligation of the sac, clearer view of the abnormal obturator artery, partial division of Gimbernat's ligament under direct vision, and its superiority is best demonstrated in the strangulated case or when resection is necessary, when it may be required to work both from above and below Poupart's ligament. It also permits of a more efficient repair, bringing Poupart's ligament to Cooper's ligament rather than Poupart's ligament to the fascia over the pectineus muscle, as in the low operation. The conjoint tendon and internal oblique may then be sutured to Poupart's ligament to prevent direct hernia. As a matter of fact all three structures, conjoint tendon, Poupart's ligament and Cooper's ligament may be incorporated in the one suture.

The strangulated hernia is a surgical emergency. It accounts for 50 per cent of all cases of intestinal obstruction, and has a total mortality of upwards of 20 per cent, which is increased fivefold after 24 hours have elapsed. The small hernia is more subject to strangulation than the large. The constricting agent is the neck of the sac or the external ring in the inguinal, and Gimbernat's ligament in the femoral.

Taxis, which is the manipulative reduction of a hernia, is dangerous in the presence of strangulation, as it may result in apparent reduction with persistent symptoms due to one of the following complications: (1) rupture of intestine; (2) reduction "en masse" into a space in the abdominal wall or into the abdomen; (3) reduction through a hole in a torn sac; (4) reduction through a hole in a torn omentum; (5) reduction into a loculation of the sac; (6) reduction over a band; (7) bruising and hæmorrhage; (8) reduction of intestine damaged by the patient or others in their earlier attempts to reduce it. Accordingly we have enumerated several "don't" in taxis. (1) Don't employ taxis in any but inguinal hernia; (2) don't

employ taxis unless seen in the first six hours; (3) don't employ taxis in small hernias; (4) don't employ taxis in cases with acute obstructive symptoms of early onset; (5) don't employ taxis in cases previously irreducible.

These indicate that taxis should only be employed in large inguinal hernia, previously reducible, without acute symptoms, and seen early; or in cases where surgical aid is not available. Taxis is successful when the contents of the hernia are reduced to the abdomen and when symptoms are relieved.

The rare cases reported of patients with strangulated hernia who have survived without operation are explained by self reduction, strangulation of omentum only, or the formation of a fæcal fistula, and should not deter the surgeon from advising immediate operation in every case. The anæsthetic *must* be spinal or local.

The treatment of the strangulated intestine depends on two things, the condition of the patient, and the condition of the intestine. Decide if the gut is safe, doubtful or gangrenous. Indications of viability are persistence of sheen, change in colour, and the movements of peristalsis. If the intestine is safe replace it. If it is doubtful apply moist warm sponges, look for change in colour and peristalsis, and if still doubtful consider the patient's condition. If the patient is fit it is safer to resect the gangrenous loop. If the patient is not fit the loop may be replaced just inside the abdominal wall and a drain left down to it.

If the intestine is gangrenous and the patient is fit resect and anastomose. If the patient is not fit, as it is usually the lower small bowel that is involved, it is best to drain the two ends of the loop after resecting it; then an anastomosis may be done later if recovery follows.

Remember: (1) that if merely the constriction groove is greyish and gangrenous it may be oversewn; (2) in resecting remove at least two feet of the proximal soggy, distended bowel; (3) a side-to-side anastomosis takes longer but is easier to do; while an end-to-end anastomosis can be done more quickly, but is harder to make water-tight at the mesenteric attachment, which is uncovered by peritoneum.

We may merely mention a few points in the injection treatment. The aim is to sclerose the contents of the inguinal canal so as to obliterate the sac. The injections, 12 to 20 in number, are placed about the cord, deep to the fascia of the external oblique, as felt with the needle point, using a fulcrum test. It is contraindicated in large herniæ with an opening exceeding 3 cm. in diameter, in irreducible herniæ, in femoral herniæ because of the proximity of the vein, and because a truss will not control the hernia, and in cases associated with undescended testes, or where the skin is unhealthy.

The two requisites of the case suitable for injection are that it be reducible, and that a truss which efficiently maintains reduction may be worn continuously for 6 to 8 weeks, and in the daytime thereafter for 6 to 12 months. Some results reported indicate that the hernia is controlled in all but about 10 per cent of cases, and that complications of a minor nature follow in about 5 per cent. Other reports state that cure was only effected in 3 per cent of cases, and some centres have abandoned the method. Such divergent claims only indicate the truth, that no accurate knowledge is available as to the end-results. The injection treatment takes 4 to 5 months, may be painful, and shows the best results in those cases which are simplest from the operative viewpoint; while those cases in which operation may be hazardous are often the very cases with large deficiencies, chronic cough, and weak musculature, in which injection treatment will fail. The method is still in the hands of enthusiasts, and the results which might be expected from the universal employment of this method are as yet unpredictable.

ACTION OF SULPHANILAMIDE.—In experiments on the effect of sulphanilamide on streptococci *in vitro* it was discovered that the presence of peptone interferes with the bactericidal action of this drug; when the cocci were separated from the peptone broth in which they had grown and re-suspended in serum an inoculum which would otherwise have grown was killed. Streptococci are able in the absence of sulphanilamide to utilize the constituents of serum for growth. The action of sulphanilamide in the body may therefore be an interference with the process whereby streptococci can utilize serum proteins for growth; the inactivation of the necessary enzyme would explain such an effect.—Lockwood, J. S.: *J. Immunol.*, 1938, **35**: 155. Abs. in *Brit. M. J.*

THE INTRAVENOUS GLUCOSE TOLERANCE CURVE AS AN INDEX OF LIVER FUNCTION AND LIVER REPLACEMENT THERAPY IN CASES OF HEPATIC INSUFFICIENCY

BY REGINALD WILSON, M.D., M.R.C.P.(LOND.)

Vancouver

BECAUSE of the multiplicity of normal liver functions, and since liver tissue is provided in the human being on a scale to meet maximal demands, it has been extremely difficult to devise a test which will measure early deficiencies in function. The study of the intravenous glucose tolerance in the two cases now reported indicated that defective tolerance was a measure of mild hepatic insufficiency. The treatment with liver extract seemed to be helpful in restoring normal function in these cases.

C. W. Ross,[1] (following Himsworth) suggests that removal of sugar from the blood depends in part upon a substance (insulin kinase) formed in the liver. This is believed to be contained in crude liver extracts. When intake of carbohydrate is diminished or its absorption is impaired by disease, the removal of sugar from the blood is defective, probably due to insufficient stimulation of the liver to produce insulin kinase. Ross demonstrated this in cases of cœliac disease and abdominal tuberculosis. In both these diseases the flat type of intravenous glucose curve was observed when the sugar was given by mouth, implying delayed absorption. In such cases the curve obtained when the sugar was given intravenously was high and delayed in its fall. This suggested delayed utilization of the sugar due to insufficient insulin kinase.

METHODS AND DOSAGE

The technique Ross recommends is as follows. The fasting patient is given a dose of glucose intravenously. The dose varies according to body weight, *e.g.*:

TABLE I.

Body weight	*Glucose*	*Campolon*
up to 20 lbs.	5 grams	1 c.c.
20 to 60 "	10 "	2 "
60 to 100 "	15 "	4 "
adults	20 "	4 "

Glucose given as 20 per cent solution in normal saline.

Blood sugar estimations are then done at intervals of 2, 4, 6, 8, 10, 15, 20, 30, 40 and 50 minutes, and the results charted as a graph. In the average of many normal controls done by Ross the curve rises immediately to about 250 mg. per 100 c.c. and then gradually falls off to about 120 within 30 minutes. In the cases with insufficient insulin kinase the curve may rise suddenly to 450 and fall slowly so that the blood sugar has not reached normal at 50 minutes (see Figs. 1 and 2). The following day this technique is repeated 10 minutes after a dose of liver extract has been given intravenously. The second curve now approaches much nearer to the normal average.

It was suggested by the results of the cases here reported that the enzyme is deficient in cases of ordinary liver damage from various causes.

MATERIAL

The material discussed here consists of two cases of mild liver insufficiency investigated by the Ross technique.*

CASE 1

Doris S., aged 8 years, was admitted to the Hospital for Sick Children on account of malaise, loss of weight, anorexia and frequent nose-bleeding. She had been perfectly well before this and her past history contained no reference to a possible predisposing cause.

On examination, the positive findings were: moderate pallor, wasting and enlargement of the liver to four fingers' breadths below the costal margin. The spleen was enlarged and easily palpable. There were small dilated superficial venules on the cheeks.

Laboratory findings. — Red blood cells 4,400,000; white blood cells 5,200; hgb. 70 per cent; colour-index 0.8. Differential count: polymorphonuclears 24 per cent; lymphocytes 67 per cent; mononuclears 7 per cent; reticulocytes, from 1 to 3 per cent. The platelets were normal. Bleeding and coagulation time were normal. Urine: normal and sterile. The Wassermann test was negative. Fragility of red cells, normal. Van den Bergh reaction: direct negative, indirect, less than 0.5 units. Sedimentation rate 15 mm. in one hour. (Normal up to 10 mm.). Cerebrospinal fluid normal. Widal test negative; Mantoux test negative.

The exact diagnosis in this case was difficult. The more common causes of hepato-splenomegaly were eliminated by the blood count, fragility test, and the Wassermann test. Banti's disease

* These cases were demonstrated before the Children's Section of the Royal Society of Medicine of London and a short summary of their notes appeared in the Proceedings.[2]

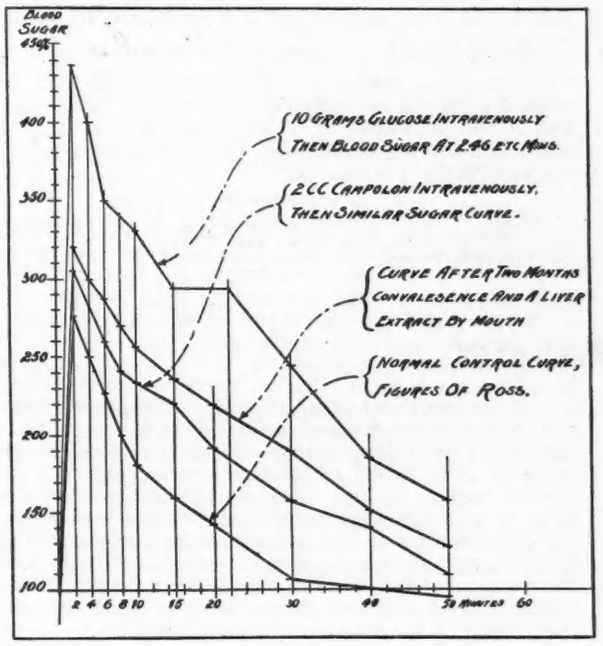

Fig. 1

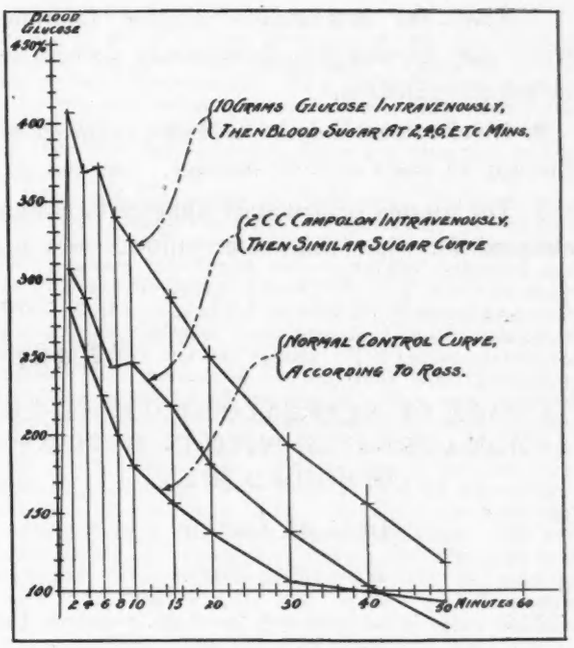

Fig. 2

Fig. 1.—Intravenous blood sugar curves in Case 1 before and after treatment compared with the normal curve. **Fig. 2.**—Intravenous blood sugar curve in Case 2 before and after treatment compared with the normal curve.

and early cirrhosis of the liver were considered, but these are difficult to prove.

The intravenous glucose curve was very high and delayed in its fall (Fig. 1). After liver extract (2 c.c. campolon) intravenously it was restored to nearer normal values, indicating failure of liver function and insufficiency of insulin kinase. After three months' convalescence and a course of liver extract by mouth (Ext. Hepatis liq. ½ oz. B.D.) the intravenous curve was again repeated and found to be still further improved (Fig. 1).

A biopsy of the liver was undertaken in this case to try to determine the exact nature of the liver damage. The gross appearance of the liver was quite normal, save for the enlargement. Histologically there was a definite small-round-cell infiltration in the portal radicles. It was concluded therefore that the disease process was a low grade hepatitis of unknown causation.

On examination 6 months after discharge the child was found to have gained weight and to be in excellent general health. The liver and spleen were no longer palpable.

CASE 2

Thomas C., aged 8 years, was admitted on account of jaundice and malaise which had begun suddenly a few days previously. The past history and family history were irrelevant. On examination the only positive findings were jaundice and an enlarged liver.

Laboratory findings.—Urine: bile pigments present. Stool: bile pigments absent. Van den Bergh reaction, direct, positive, biphasic; indirect, 7 units. Plasma phosphatase, 51 units (normal 5 to 15). X-ray of abdomen showed no evidence of calculus. *A diagnosis of catarrhal jaundice was made.*

There was a rapid clinical recovery, although the plasma phosphatase remained raised (35 units) after the van den Bergh test and the urinary bile pigments had become normal. The patient was discharged apparently cured, but was re-admitted six weeks later with an exactly similar attack. Plasma phosphatase then was 43 units. A similar clinical recovery rapidly took place. This time the van den Bergh again became normal and the plasma phosphatase remained slightly elevated (19 units). A lævulose tolerance test for liver function was perfectly normal. Intravenous glucose curves however, were very high and delayed (see Fig. 2). After a single dose of campolon intravenously the curve was much nearer the normal. These findings also suggested failure of liver function and insufficiency of insulin kinase. The liver therapy was again continued by mouth, and the patient was found to be normal on examination six months later.

SUMMARY AND CONCLUSIONS

The original work of Ross is discussed, and two cases illustrating its possible application are recorded. These illustrate:

1. That the intravenous glucose tolerance curve may be useful to detect early deficiencies in hepatic function.

2. Liver extract may be used as a replacement therapy in cases of liver damage.

3. The plasma phosphatase appears to remain elevated for some time after clinical cure has taken place in the catarrhal jaundice of childhood and may be of prognostic importance.

I wish to thank Dr. E. A. Cockayne and Dr. Donald Paterson for permission to publish their cases, and Dr. W. W. Payne, of the Hospital for Sick Children, Great Ormond Street, London, for kind assistance with the laboratory procedures.

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Case Reports

A CASE OF STAPHYLOCOCCIC SEPTICÆMIA TREATED WITH INJECTIONS OF BOILED MILK

BY J. M. OGILVIE

Humboldt, Sask.

This case is of interest in that it shows the rapid response which followed the use of boiled milk injections after all other measures had proved of no avail.

A.L., aged 17, was admitted to St. Elizabeth's Hospital, Humboldt, on August 26, 1937, complaining of swelling on neck with purulent discharge for ten days; cough and expectoration for the previous three months; general weakness for three months.

Family history.—Irrevelant.

Personal history.—Farmer's son; normal weight 132 lbs.; healthy until three months before but had worked until the previous week.

Present illness.—Two weeks before he had developed a swelling on the back of the neck which was very painful. After poulticing this opened in two places with discharge of pus. The swelling became larger and he was unable to sleep for several nights. He was unable to eat and becoming so weak that he staggered while walking. He was admitted to hospital for treatment. He stated that he had been getting progressively weaker for three months and that he coughed considerably with expectoration of mucus. This was of copious amount but never contained blood.

Examination.—The patient was a fairly well developed, but poorly nourished boy of 17. He was very pale, emaciated, and staggered as he walked. There was a carbuncle, the size of a large orange, on the back of the neck, with two openings draining pus. The pus had burrowed under the skin down to the right scapula, with an abscess pointing over the scapula.

Lungs.—Coarse moist râles were heard over both lungs and there was a marked area of dullness over the base of the right lung.

Heart and *abdomen* were negative. The Wassermann test was negative; tuberculin test, negative. Repeated sputum examinations were negative. Pus from the carbuncle and abscess contained *Staph. pyog. aureus*, as did all other subsequent abscesses and blood culture and the empyema. Blood pressure, 105/60. Urine negative.

Progress.—August 27th, excision of carbuncle under chloroform; the abscess over the scapula was lanced. He was very toxic. Interstitial glucose and saline were given in the chest.

September 2nd.—I lanced two abscesses at the site of the interstitial injections on chest. His temperature was 104°, pulse 110 and respirations 30 on admission. This condition did not change after treatment of his carbuncle and a film was taken of his lungs.

X-ray report, of lungs (Dr. H. C. Boughton, Saskatoon Sanatorium) September 9th.—"Right lung—There appears to be a large pneumothorax in lateral margin reaching from second rib to base and being 5 to 8 cm. wide at axilla. In this there are several fluid levels so there is probably some connection with the bronchi and trachea,—in other words, a pleuro-bronchial fistula which is affording drainage. In the remainder of the lung there are increased shadows which may be due to tuberculosis but of this one cannot be sure until the pyopneumothorax has been dealt with. Left lung—In the outer part of all interspaces and throughout the lower half of the lung there are changes suggesting tuberculosis."

September 4th.—A bed sore developed over the sacral area. 15th.—The abscess on the left side of the chest was lanced. 20th.—In very poor condition, cyanosed, restless and complaining of pains in the right arm and leg. He perspired freely at times. 23rd.—Lanced abscesses on right shoulder, left elbow, and over the right scapula.

September 24th.—Under novocaine five inches of the eighth rib in the axillary line were removed. The lung was seen to be collapsed with a layer of creamy pus over it. One pint of pus was aspirated with a suction tube. No adhesions were seen or felt between the parietal and visceral pleuræ. An empyema tube was sewn into the wound and the wound closed. An abscess under the right pectoralis major muscle was also opened at the same time. The empyema cavity was irrigated with saline at first and later with Dakin's solution.

October 11th.—I lanced an abscess on the right shoulder. The temperature still ranged from 99 to 104° F., going up at 4 p.m. daily. 25th.—Complained of pain in the left hip. X-ray film negative for tuberculous spine and hip-joint. 30th.—I lanced a deep abscess in the left buttock; patient failing progressively and his condition precarious. Weight 82 lbs. Red blood cells, 2,630,000; white blood cells, 27,750; hgb., 65 per cent; colour index, 1.20. Temperature still the same.

November 4th.—Consultation with Dr. D. Baltzan, Saskatoon. Sulphanilamide had been tried for past two weeks without response. It was decided to give a series of transfusions and use staphylococcus antitoxin.

November 5th.—Another x-ray showed.—"There has been remarkable improvement in the mottling since film of September 9th was taken. The empyema space has decreased a little—2 cm. wide at lower part of axilla."

Mercurochrome, 20 c.c. of a 1 per cent solution, was given intravenously. This dose was repeated on 6th, 7th, 8th. There was no amelioration of symptoms or temperature. 9th.—A transfusion of 700 c.c. citrated blood was given. This was repeated on 16th, 20th, 26th, December 3rd, 9th, 16th. Staphylococcus antitoxin, 5,000 units, was given subcutaneously night and morning; repeated on the 10th and 11th.

10th.—I lanced the left hip and both thighs for abscesses.

24th.—White blood cells, 19,000. One c.c. staphylococcus mixed vaccine was given hypodermically; repeated daily for six days.

December 2nd.—I lanced the right thigh.

17th.—The right leg below the knee and the right arm at the elbow were lanced. Temperature remained the same as before. Condition the same. 18th.—Fifteen c.c. of boiled milk were injected subcutaneously in chest. Repeated on 19th. On my return from Christmas holidays I was surprised to see the patient still alive, and, as the temperature had dropped, decided to continue the milk injections.

21st.—Temperature 103°; pulse 100. 28th.—Temperature 101°; pulse 90. 30th and 31st.—Fifteen c.c. boiled milk subcutaneously. Repeated on January 2nd, 3rd, 6th, 7th, 11th, 14th, 19th, 20th.

January 12th.—There has been a steady drop in temperature and pulse to normal. On 18th a rise up to 103° for one day and the temperature has remained down since. This was due to bronchitis. 14th.—Empyema drainage tube removed. All other incisions healed. 22nd.—Ten units insulin were given before meals to stimulate appetite; continued until February 7th.

February 20th.—Empyema sinus healed. Up in chair for an hour.

March 10th.—Discharged. Weight 112 lbs. He felt well and was able to walk about. A follow-up on October 1, 1938, showed that he had had no trouble since and was able to do light work. His weight was now 134. He had had no boils or abscesses.

A CASE OF CARCINOMATOSIS INVOLVING THE STOMACH AND PERITONEUM; PAPILLOMATA OF THE INTESTINES; INTUSSUSCEPTION

BY E. R. SELBY

Calgary

This man, when first seen on December 11, 1936, was 38 years of age. He gave a history of laparotomy in 1916 when some resection of small bowel was done. The primary diagnosis had been appendicitis, but the surgeon found "adenoids" in the bowel. The patient had been constipated for years, this becoming absolute in the four days previous to admission, with cramp-like abdominal pains increasing in frequency and severity.

On examination, temperature 100°; pulse 100; respirations 20. The abdomen was acutely distended, especially splinted in the upper left quadrant and somewhat less in the right. The rectum was empty. Lungs, negative. The heart was not enlarged, regular, with an old mitral defect. Urinalysis, negative. White blood cells 16,600; polymorphonuclears 90 per cent. Enemas were ineffectual. Laparotomy showed free bloody fluid in the peritoneal cavity, very extensive adhesions, a tremendously distended colon incarcerated in the pelvis, two extensive intussusceptions in the small bowel, one of which evidently contained a polyp. This lesion was proximal to the lateral anastomosis site, the polyp some 18 inches from it. Adhesions were freed, intussusceptions reduced, but further procedures postponed to later date because of the general condition of the patient.

Recovery was good. The temperature was never above 100.4°, with a pulse of 120. No gas distension. The bowels moved by enema on the 15th inst. and naturally on the 17th. The sutures were removed on the 18th with apparently good union. Two strips of adhesive support were applied over the incision. At noon on the 21st the lower part of the incision opened, the omentum protruding. This was closed under local anæsthesia. Five through and through silkworm gut sutures were inserted. Ten days later union was apparently firm, the man was discharged on the 22nd day, to return later for resection of the polypous area.

He was readmitted on February 1, 1937, feeling well and in good condition. Laparotomy on the 2nd showed extremely dense and fairly universal adhesions. The jejunum and ileum were carefully palpated and no evidence of polypi found. As the one previously palpated had been about an inch in diameter and with a small, long pedicle it was presumed to have sloughed and the bowel was not opened. The recent abdominal incision area contained an apparent bony formation in about one-third of its length. This was reported from the laboratory as normal cancellous bone without any evidence of tuberculosis or malignancy. Union was normal this time. The patient's condition remained good until about June 1, 1938, at which time constipation and gas in the bowels were very disturbing factors. He was seen on July 1st. He had been losing some weight, though the abdomen was enlarged through distension. He had an area of marked tenderness in the gall bladder—pyloric region. The abdomen was very prominent and tense. Enemas were regularly necessary to evacuate the bowels. X-ray examination suggested extensive malignancy of the pyloric portion of the stomach, with small bowel obstruction possibly due to adhesions. The condition was not considered as amenable to surgery or x-ray treatment. General retrogression was rapid with a persistently distending abdomen, effectual enemas being given approximately every 48 hours. Death occurred on August 24, 1938.

The autopsy showed nothing extraordinary beyond the abdomen. The older abdominal scar contained hard irregular bony masses. With the exception of a small, round, whitish nodule in the left kidney the dominant lesions were in and about the gastro-intestinal tract. The intestines were bound together by a mass of adhesions centring especially below the right costal margin. The peritoneal cavity contained quarts of brownish yellow clear thin fluid in which were floating small translucent, yellowish cellular masses. All peritoneal surfaces were studded with small, whitish growths. A large mass was present in the duodeno-pyloric region involving the transverse colon and the great omentum, and adherent to liver and pancreas. This appeared to have originated in the pylorus. A small round ulcer with raised rounded edges lay in the posterior wall of the fundus of the stomach and quite separate from the tumour of the pylorus. Three small friable papillary finger-like projections were present in the first portion of the duodenum. The small bowel contained several cauliflower-like polypoid and papillary masses attached to the mucosa by long, thin pedicles. These were practically impalpable through the bowel wall, and were not recognized until the bowel was opened. One such mass was found in the transverse colon area. Several of these at one point had continued to form an intussusception (oldstanding) of 14 cm. in length. Several of these polypi headed the intussusception. The mucosa and walls of the intestine in the old anastomotic area were in good condition.

Microscopically, generalized intra-abdominal carcinomatosis was demonstrated, this due to primary carcinoma of the pylorus. The papillary masses were benign, as was the kidney nodule.

Therapeutics and Pharmacology

PNEUMOCOCCUS PNEUMONIA*

BY LILLIAN A. CHASE

Regina

The pneumococcus was discovered in 1880. In 1910 Neufeld and Haendel discovered there were three fixed types. Between 1929 and 1932 Cooper and associates identified 29 additional types. In 1902 Neufeld found that types of pneumococci could be identified when the organism in question was mixed with the homologous anti-pneumococcic serum through a swelling of the peripheral zone or capsule. The Neufeld method was adapted to the examination of sputum in 1932.

The first use of specific serum, unconcentrated horse anti-serum, was made in 1913 by Cole and his associates at the hospital of the Rockefeller Institute. By 1929 Cole had treated 371 cases of Type 1 pneumococcus pneumonia, with the low mortality rate of 10.5 per cent, against an expected rate in untreated Type 1 cases of about 30 per cent. At the Massachusetts General Hospital specific treatment was first employed in 1914, and has been in use since that time. The average amount in Cole's series was 420 c.c. In 1924 Felton succeeded in concentrating anti-pneumococcic horse serum so that a small amount was potent.

From 1931 to 1935 inclusive Massachusetts embarked on a pneumonia program. Over 1,700 patients with pneumococcus pneumonia were treated with specific anti-serum by 1,100 physicians. In 1935 New York adopted a similar program. New Jersey, Pennsylvania, District of Columbia, Maryland and Iowa also have a program. Many other states are considering it. Surgeon-General Parran formed a Pneumonia Committee in the fall of 1937. These programs are best planned as community projects. They require the cooperation of state departments of health and of the medical profession as a whole. They should be administered under the state department of health and of the medical profession as a whole. Serum should be freely distributed to all who need it. A large proportion of cases are due to types of pneumococcus against which there are specific anti-serums. In pneumococcus lobar pneumonia about 80 per cent of the cases are due to Types 1, 2, 3, 5, 7 and 8. We have specific therapy against all these except Type 3. About 6 per cent of the cases, including both lobar and broncho-pneumonia, are due to this type.

Two conditions likely to be mistaken for lobar pneumonia are pulmonary infarction and pneumonic phthisis. The bloody sputum in pulmonary infarction is likely to be pure blood mixed with mucus; the sputum of pneumonia is typically rusty. The temperature in infarction rises more slowly than in lobar pneumonia. In pneumonic phthisis the sputum is greenish rather than rusty; the tubercle bacillus is likely to be present. There is no leukocytosis.

The first responsibility of the physician of the pneumonia patient is to determine the type of the pneumococcus responsible for the infection. The sputum from the lower rather than from the upper part of the respiratory tract is more likely to contain the inciting agent. It is important to take a blood culture in each case before the serum is given. Blood cultures are an indispensable guide to dosage. With all patients who have a Type 1 or Type 2 pneumococcus infection we rely on the diagnosis of type, and conclude that the pneumonic process is due to these particular organisms. This is not true of the other types; it is always desirable to repeat the typing in order to avoid error.

Mortality rates in the teens are about 6 per cent with lobar pneumonia; the rate rises to about 60 per cent at 60. Larger doses of anti-serum should be given as patients advance in years. Patients in whom only one lobe is involved have a relatively low mortality rate; when one lobe is involved about 30 per cent of the patients die; where four lobes are involved, about 60 per cent. The extent of involvement should modify dosage. Patients with bacteriæmia have a mortality rate four to five times as great as those without it. Type 3 is the most serious. There is no anti-serum for it. The mortality rate is a little over 50 per cent. The rate in Type 1 is 30 per cent, in Type 2 a little over 40 per cent. The mortality rate in serum-treated cases has been reduced to about half what it would be without it. With Type 1 a 5 per cent mortality or less may be expected in patients treated within the first twenty-four hours, and a 25 per cent mortality if they are treated within the first four days.

The initial dose in Type 1 pneumococcus pneumonia should be at least 60,000 units; in Type 2, Type 5, and Type 8 at least 100,000; and in Type 7 at least 60,000 or 90,000. The dose should be doubled if the patient is over 40, if treatment is begun after the first three days of illness, if more than one lobe is involved, if the patient is pregnant or in the post-partum period, or if bacteriæmia is present. The first dose should be given in one injection. The first is only a test injection and should not exceed 2 c.c. in amount. After two hours, more serum should be given. This may well be the rest of the vial, and after two more hours a third injection, the contents of two vials, should be administered. Further injections may be given at two hour intervals. No single injection should exceed 50 c.c. Additional injections of 40,000 to 60,000 units should be given every three or four hours in all severe cases and in any case in which the temper-

* Abstract from an article by F. T. Lord, *New Eng. J. of Med.*, 1938, **219**: 13.

ature response is not favourable, or in which bacteriæmia is present, regardless of the clinical course, or in which there is a spreading lesion.

BACTERIOLOGICAL AND SURGICAL PRINCIPLES IN THE MANAGEMENT OF SURGICAL SEPTICÆMIA

By Frank S. Dorrance

Montreal

Septicæmia is an illness characterized by an intermittent or sustained fever with malaise and prostration accompanied by the continued presence of bacteria in the blood stream.

Bacteria gain an entrance through a break in the surface of skin or mucous membrane. They most readily gain a footing in the presence of injured tissue or foreign body. The poisons formed may attract or repel the phagocytic cells (polymorphonuclear neutrophils, lymphocytes or the "fixed" and "wandering" reticulo-endothelial cells), or they may liquefy dead tissue or kill and injure living cells. The bacterium may be effectively destroyed by the phagocyte or it may continue its activity in the phagocyte until the protective cell is in turn destroyed and cell rupture takes place. This latter process may take place in the primary focus or it may occur in the blood stream, lymph-stream or lymph node or in the organs of the reticulo-endothelial system. The bacteria may be carried outside the blood vessel or lymph channels by the phagocytes with the production of perivascular changes; or, they may be arrested in the aseptic thrombus, formed as a result of venous slowing, with subsequent liquefaction of the thrombus and embolus formation, aseptic and septic, and again the bacteria may escape the attacks of the tissue and blood phagocytes and lodge in distant organ or tissue with the infrequent production of necrotizing lesions of metastatic formation. The infrequency of suppurative metastatic foci is evidence of the efficiency of the local defense forces. The mechanical factor, size of the embolus, is of marked importance in the continuance or failure of circulation. In the majority of fatal cases there are multiple suppurative metastatic foci with a certain number of vegetative endocarditis among them. With those cases which terminate in recovery we may assume, (1) a subsidence of the infection in the clots, and (2) a fixation of the clots in the blood-stream.

Working upon experimental animals it has been shown that there is a sublethal, minimal lethal and lethal dose of organisms when these are injected intravenously. The reaction of the body depends upon the kind, quantity and virulence of the organisms injected. In sublethal doses the blood was clear of organisms in one to two hours. In lethal doses the number diminished rapidly or completely disappeared but in a short time re-appeared in increasing numbers with death in 4 to 5 days; the rapid disappearance was explained by the finding of large numbers of these organisms in the endothelial phagocytes of the lungs, numerous organisms in the endothelial phagocytes of the liver and spleen, a few in the bone marrow and lymph nodes and few or none in the kidneys, muscles and blood within one-half hour after injection; in 5 to 6 hours most of them were found in the lung and liver. Small numbers of organisms in repeated injections may be disposed of by these tissues but one large injection usually overwhelms this defense mechanism. The other defense mechanism, the humoral, is natural and/or acquired and includes the agglutinins, opsonins, bacterolysins, antitoxins, leucones, plakins and complement. Probably very little growth of organisms takes place in the blood itself unless circulation has been arrested. In this connection it must be remembered the blood circulates in one minute or less whilst multiplication of bacteria occurs in about 20 minutes so these bacteria have to "run the gamut" of the reticulo-endothelial cells about 20 times before they subdivide. In a blood which shows the same number of colonies per c.c. on repeated tests it must be realized the distributing foci will eventually overwhelm the defense mechanism and more radical measures of treatment are urgently required to avoid a fatal issue. Certain organisms such as the meningococcus, gonococcus, *H. influenzæ* and for the most part pneumococcus show a tendency to self-linitation without extensive tissue destruction, and medical measures may be persisted in to a relatively longer period of time than in the case of the following which are given in order of frequency and which necessitate the surgical procedures of excision, incision or isolation for their eradication. These are the (1) Hæmolytic streptococci, (2) Hæmolytic staphylococcus aureus, (3) Non-hæmolytic Staphylococcus aureus, (4) Non-hæmolytic streptococcus, (5) *B. coli*, (6) Anærobic non-hæmolytic streptococcus, (7) Staphylococcus albus, (8) *B. mucosus capsulatus*. (1) is usually present in otitis media, tenosynovitis and cellulitis, (2) in carbuncles, parotitis, abscesses (well-localized) and osteomyelitis, (3) *B. coli* in peritonitis and upper and lower urinary tracts, along with (1), (2) and (4), which last is most often found in grave face and neck cases, liver and peritoneal abscess. (1) and (2) are the most frequent organisms found in vegetative endocarditis.

The clinical manifestations may be grouped into (1) The rapidly progressive fulminating fatal case, (2) The plateau type which has a slow course to recovery or fatal issue. (3) The transient which terminates quickly in recovery, often spontaneously. (4) The terminal which develop in some debilitating disease. Prophylaxis is the most effective treatment and in this connection reiteration is worthwhile. There are two groups of cases which are particularly susceptible to injudicious handling and meddlesome interference, respectively.

Abstract of a paper by F. L. Meleney, *Surg., Gyn. & Obst.*, 1938, **67**: 513.

TREATMENT

The first includes the punctured wound and the lacerated wound. The punctured is best exemplified by needle and pin and nail; the hot soak at 108 to 112 degrees, in and out, for one hour is recommended; this will usually terminate favourably all those except where heavy inoculation has been made. If relief is not obtained, open freely to its depths, continue hot soaks and apply an ice bag to the regional lymph nodes. The lacerated is exemplified by abrasions also, with the necessity of thorough cleansing, mechanical removal of foreign bodies and use of soap water and a brush; contused edges may be excised or débrided, if not more than 2 hours old. and primary suture undertaken, allowing sufficient space for free escape of exudate. In wound of the face and scalp more than 2 hours old primary suture may still be done, but a small rubber dam should be used as a drain. The second group includes those minor pustules, furuncles, infected teeth, tonsils and otitis media, which are often lightly handled and can become such vicious affairs. There is still variance of opinion, but generally speaking localization should be well-delineated and incision made into healthy tissue on each side. In the active treatment it is the surgeon's responsibility to search for and find all suppurative foci, and when found incise or excise into healthy tissue and ligate all infected contiguous veins and their collaterals. This is the primary and practically only successful treatment yet found for the cure of surgical septicæmia. The patient should be examined for metastatic foci, daily: herein blood cultures have their value, and they should be persisted with until a succession of negative cultures is obtained. Patients may attempt to hide their metastatic foci.

For many years there has been search for chemicals with which sterilization of the blood stream may be obtained. At the present time sulphanilamide is granted a high place in the treatment of hæmolytic streptococcus infections. The dose of 1 gram per 20 lbs. of body weight is usually sufficient to maintain the blood concentration of 10 milligrams per 100 cubic centimeters and should be maintained for 3 to 4 days after subsidence of symptoms and then reduced to half this amount for a week to 10 days. The use of bacteriophage of such high potency that all causative organisms in the bacteriophage suspension are incapable of growth when placed on blood agar has given good results in *B. coli* and *Staphylococcus aureus*. Meleney gives a 1 in 10 saline dilution in doses of 1, 2, 5, 10, 20, 30 and 40 cubic centimeters at hourly intervals. Fixation abscesses have not been shown to have any influence in materially increasing the resistance of the host or modifying the course of the disease. Animal charcoal intravenous injections have been reported with success in a small series but as yet no definite clear-cut evidence of their efficiency has been forthcoming. Serotherapy in streptococcus and staphylococcus infections has not been shown to be of marked value either by the antitoxin intracutaneously, the use of very young encapsulated forms or by the method of Cadham, although the latter method has had some favourable reports. Cadham reports recovery of 85 cases out of a total of 95 which is probably the highest percentage yet obtained. Blood transfusion has been extensively used. It is possible those favourable cases have received specific antibodies; Lyons suggests one donor in 10 or 20 may have potent natural opsonins for the patient's organisms and the donor's leucocytes may show a high degree of phagocytic power. Blood transfusion has the further advantage of supplying erythrocytes and hæmoglobin when these are sorely needed. Meleney finds it difficult to evaluate the reports inasmuch as there is no universal criterion for judging results. At the same time surgical measures have probably the greatest value of all the forms of treament.

Clinical and Laboratory Notes

A NEW SAFELIGHT FOR THE DEVELOPMENT OF RADIOGRAMS

More films are ruined in the processing room than are spoiled by improper exposure or other technical errors. Much of this loss results from fumbling in the semi-darkness of dim safelight illumination. Thus radiographers will welcome a newly developed safelight specially for use with x-ray film, which transmits many times more visible light than the now widely used Eastman-made Wratten Safelight, Series 6A.

The new product is the Wratten Safelight, Series 6B, just announced by the Canadian Kodak Company. Used in a direct-type safelight lamp, the Series 6B Safelight transmits ten times more useful light than the older 6A, and with indirect-type safelights sixty times as much illumination is provided.

With the new Wratten Safelight, Series 6B every operation in the manipulation and processing of x-ray film may be performed by "sight" rather than "touch". Eyestrain is minimized and working conditions are improved. The pleasanter darkroom atmosphere alone justifies the slight cost of installing the new Series 6B Safelights to replace older, less efficient ones.

THE IDENTIFICATION OF GONOCOCCI IN COMPLICATIONS OF GONORRHŒA

R. J. Reitzel and C. Kohl indicate the necessity of making certain of the diagnosis when

complications of gonococcic infections are involved, and show that bacteriological procedures of proved value, which are relatively rapid and simple in performance, are now available for more widespread clinical use. During the past five years they recovered the gonococcus from blood, synovial fluid, pus from tendon sheaths, material from cutaneous lesions, peritoneal fluid, fluid from an abdominal cyst, material from ovarian and Bartholini glands and material from labial, periurethral and perianal abscesses. They have in many instances cultured the gonococcus from cervical, urethral or prostatic discharges when examination of smears gave negative or inconclusive results. In fourteen of twenty-five cases of proved gonorrhœal arthritis the history did not indicate previous gonococcic infection, and in these cases either the routine smear was reported to be negative or no urethral or cervical discharge was obtainable. The diagnoses were made by recovering the organisms from blood (in seven cases), synovial fluid (in sixteen cases) or both (in two cases).—*J. Am. M. Ass.*, 1938, **110:** 1095.

Editorials

H. PERTUSSIS VACCINE IN THE PROPHYLAXIS AND THERAPY OF WHOOPING COUGH

SINCE the demonstration that *H. pertussis* occurs in various antigenic phases only certain of which represent the virulent form, attempts have been made to prepare vaccines, whether of whole organisms or of fractions, solely from bacilli in the virulent phase. Before considering the results obtained with vaccines either in influencing the course of whooping-cough after symptoms have developed or in preventing an attack in healthy children a brief description of some of the vaccines in use will be attempted. (1) Vaccines of whole organisms. These are prepared from phase I, *H. pertussis*, grown on Bordet-Gengou medium, and killed either by formalin, phenol or merthiolate. Each c.c. contains 10 billion bacilli. The injections are usually made subcutaneously at weekly intervals, a total of 70 to 80 billion organisms being given in a period of three or four weeks. (2) Vaccines prepared by disrupting the bacillary bodies either chemically of mechanically. Extracts of mechanically disrupted cells are used in the Krueger vaccine, and denaturation is avoided by omitting the use of either heat or chemicals. Bacilli treated with a surface tension depressant are used by the Glaxo Laboratories in their dissolved vaccine. (3) A detoxified toxic product analogous to a toxoid. The Lederle Antitoxic Laboratories manufacture a vaccine which is prepared by treating a toxin from *H. pertussis* with formalin. (4) A chemical fraction derived from *H. pertussis*. An antigenically-active fraction which possesses immunizing potency has been isolated by Cruickshank and Freeman[1] from bacterial bodies digested with trypsin, filtered, and precipitated with alcohol.

It is generally recognized that the efficacy of any prophylactic agent can only be assessed with certainty by field trials with exposure to natural infection. In man trials in statistically significant numbers have only been accomplished in the case of vaccines of whole killed organisms and the results with the other vaccines are quoted merely in the endeavour to point the way that future developments may take.

Vaccines of whole organisms killed with formalin have been shown by Burnet and Timmins[2] to protect mice against an intraperitoneal inoculation of living *H. pertussis* that will kill the majority of controls. In humans Kendrick and Eldering[3] have presented evidence of a statistically significant difference in the incidence of whooping-cough in 1,815 vaccinated and 2,397 control children in a paper read before the American Public Health Association in October, 1938. There were 52 cases of whooping-cough among the vaccinated and 348 in the control group, representing a pertussis incidence-rate based on a person-years at risk of 2.3 per cent and 15.1 per cent respectively. The figures are equally significant when exposure

1. CRUICKSHANK, J. C. AND FREEMAN, G. G.: *The Lancet*, 1937, **2:** 567.
2. BURNET, F. M. AND TIMMINS, C.: *Brit. J. Exp. Path.*, 1937, **18:** 83.
3. KENDRICK, P. L. AND ELDERING, G.: Abstract of paper read before the American Public Health Association, October, 1938, *Am. J. Pub. Health*, 1938, **26:** 506.

is correlated with subsequent attacks, *i.e.*, 80.2 per cent in the control and 16.7 per cent in the test group. The cases that did occur in the vaccinated were also definitely milder. With Sauer's vaccine prepared commercially there had been 3,974 children vaccinated up to January, 1937, and of the 219 subsequently exposed 17 contracted whooping-cough.[4]

The other vaccines have not received extensive field trials. With the Krueger vaccine Frawley, Stallings and Nichols[5] vaccinated 35 children after exposure during an epidemic in California. Of these 21 developed whooping-cough, the disease running a distinctly milder course in 16. The Lederle antigen has been used for prophylaxis in 140 children, and the 3 who developed the disease were all mildly affected. Cruickshank and Freeman's chemical fraction has so far only been tested in mice. A statistically significant difference in the survival rate of control and test animals has been reported following intraperitoneal inoculation of the average lethal dose of living *H. pertussis*, the groups containing 30 mice each.

To summarize the evidence on the value of prophylactic vaccination of children against whooping-cough, it seems to be definite that specially prepared vaccines of killed *H. pertussis* organisms will protect. The immunity is relative and compares favourably with that following a previous attack of the disease. This is exemplified by an epidemic reported by Kramer[6] among 29 children in a segregated department of a school. These included 12 susceptibles, 9 vaccinated two years previously with Sauer's vaccine, and 8 "immune" from a previous attack of whooping-cough. Intimate contact existed among the 29 for the whole seven weeks' period of observation. The 12 susceptibles ran a moderately severe course of typical whooping-cough; 6 of the 9 vaccinated had infrequent paroxysms of cough for three weeks; one coughed for a week, another for a day; and one was free. of the 8 "immune" from a previous attack 6 coughed for three weeks and 2 for a week.

Whether on the basis of what has been reported above one should advocate general vaccination against pertussis merits careful consideration. The duration of the immunity is not known exactly, and the apparent necessity of employing large doses sometimes causes severe reactions. To overcome this Blatt, Levin and Schapiro[7] have used intracutaneous inoculation of 30 billion organisms in five injections at three day intervals, and obtained results comparing favourably with a like dose given subcutaneously. The period of time necessary for immunity to develop is also not known, although it will probably be some months, and one cannot therefore be certain that vaccination will be efficacious if one waits for an epidemic before employing it extensively. In Canada in 1936 there were 594 deaths from whooping-cough, more than twice the number for diphtheria or scarlet fever. As there are usually 40 cases for every death it will be seen that probably over 20,000 children suffered in this one year from this malady.

Field trials with other antigens which are showing promise of producing immunity without the necessity of such heroic doses should be continued, but in the meantime a useful vaccine is available.

Using the Krueger vaccine of mechanically disrupted bacilli, Frawley, Stallings and Nichols treated 165 cases of whooping-cough. Seventy per cent of the 86 children treated during the first week responded well, with cessation of severe symptoms within a week. The remaining 79 treated later did not give particularly successful results. Forty-nine of 53 cases treated during the first or second week with the Lederle antigen did not develop whooping or vomiting. In 70 cases treated during the third or fourth week 30 became symptom-free after the completion of the injections, while the other 40 ran only a mild modified course. Treatment during the fifth week resulted in no benefit.

The Mulford Laboratories recommend intra-nasal instillation of a buffered saline suspension of macerated organisms for treatment. They claim that "a compilation of the clinical results reported to date by

4. SAUER, L.: *Am. J. Dis. Child.*, 1937, **54**: 979.
5. FRAWLEY, J. M., STALLINGS, M. AND NICHOLS, V. C.: *J. Pæd.*, 1934, **4**: 179.
6. KRAMER, J. G.: *J. Pæd.*, 1938, **12**: 160.
7. BLATT, M. L., LEVIN, I. M. AND SCHAPIRO, I. E.: *J. Pæd.*, 1938, **12**: 619.

different investigators is highly favourable. Of the cases treated early in the paroxysmal stage about 85 per cent are definitely benefited; whereas, of those treated late in the disease, improvement is produced in about 40 per cent.

The reported evidence at present regarding the efficacy of treating whooping-cough with pertussis vaccine is too meagre to allow of dogmatic conclusions being drawn, and further work must be awaited.

ARNOLD BRANCH.

ETHICS IN ADVERTISING

WE feel free to confess that the advertising in our *Journal* gives us more concern than almost any other phase of our work. Indeed, the matter has proved to be most difficult. This is probably due to the facts that, as compared with, say, fifty years ago, our standards have had to be altered, perhaps in some ways have become more stringent, and advertising itself has become a highly specialized calling. Medical science has in that time become more exact (perhaps we should hope that it never will become perfectly exact!) and more critical; advertising, due to competition and the spreading of pseudo-scientific conceptions, has become more assertive, tends to overstate, and has become more suggestive, more psychological. Medical science and medical advertising are, therefore, bound to clash at times. How important this "clash" is in any given case depends on circumstances. The *Journal* has a conscientious Committee on Advertising, and no advertising matter is accepted until it has the sanction of a majority of this committee. Nevertheless, once in a while, something objectionable slips by. Sometimes advertisers (who are all under contract with us) send their copy in at the last minute, too late for supervision, and it goes directly to the printer, who has by this time the *Journal* set up and in the press. The new copy must go in, otherwise there is a gap in the advertising pages. However, if under these circumstances we have to take exception to any statements this matter is adjusted before the next appearance of any particular advertisement. The selection and exhibition of advertising matter is not so simple as appears on the surface.

Then, we have to meet the criticisms of some of our readers, some of which seem to us well taken, others, not. On certain points, we find, opinions differ widely. Consequently, we have to make a decision, which decision will not please everybody. We would however remind our readers of a legend which, it is said, used to be displayed in the saloons and dance-halls in the far West during the hey-day of the mining fever—"Don't shoot the pianist, he is doing his best"!

Advertising in a medical journal may be considered from three points of view—that of the advertiser, that of the reader, and that of the editors. The advertiser naturally wishes to display his wares in a pleasing and effective manner, in a journal that has a high standing and a wide circulation, and he looks for sales. If he is wise he will be conservative in his statements, not exaggerating the merits of his products, and not using illustrations which suggest conclusions that the facts do not warrant. He should not base his statements on articles and experimental work in which the medical profession have no faith. Only the conclusions of world-famous authorities should be accepted, and not always theirs. The fact that certain work is published in a foreign journal gives it no extra weight. This fault in advertising is not so likely to appear in the case of the larger drug-manufacturing houses which have a competent medical staff; it is more evident in the case of those which have to depend on a non-medical advertisement writer. Again, advertisers in medical journals would do well to keep abreast of the times. In some ways they do, notably, in the case of hormones and vitamins, the discovery of which has been a Godsend to the manufacturing chemist. He has in these products something which he only can prepare in effective form, which have an appeal to both the medical and lay public, and have a definite sphere of action. Advertisers do not keep abreast of the times when they feature exploded ideas. "Uric acid" used to be the slogan; now it is "Alkalinization". These ideas should be dropped.

They are out of date. It is impossible to build up an alkali reserve in the body, and, if you could, in many cases this would be positively dangerous.

The medical reader, also, has his point of view. He wishes to be informed as to the recent advances in therapeutics, but he is critical of unsupported statements. Above all, he resents being instructed by manufacturing drug houses on physiology, pathology and how to handle his patients. Rightly, he feels that he has been sufficiently trained in college and in the school of experience to decide such matters for himself. Perhaps, some medical practitioners are too credulous (or is it laziness?) when they accept advertisements at their face value. Unfortunately, a medical journal has to accept a certain responsibility for the character of the advertising matter it presents, but we respectfully submit that the medical reader also has his responsibility. After all, he is the final judge. In many cases he would do as well and would spare the purses of his clients if he would write out his own prescriptions and not order, say, No. 22 (X.Y.Z. and Co.). In all cases he should examine the advertisements critically and decide for himself as to their value. No one else can do this so well.

Now, coming to the *Journal*. Medical journals, like all others, depend for their existence, in the last analysis, on their advertising. It is, of course, conceivable that a journal might be published without such extraneous aid, but this is practically impossible, on account of the cost. The editors, therefore, have to act as a board of censors. Where a laboratory staff is available to which the merits of a given preparation can be referred this phase of the matter is considerably simplified. In Montreal we do not have such. We depend in many ways on the Food and Drug Department at Ottawa and the Bureau of Investigation of the American Medical Association, to whom we gladly acknowledge our indebtedness.

The rules by which the *Journal* is guided are simple. Some may think they are not drastic enough. If there are such let them without prejudice sit down and write out their specific objections, bearing in mind particularly what evidence they can bring forward against the truth of the statements made and substantiating their own views. It is not easy. We will not publish any statement in an advertisement which is obviously untrue or grossly exaggerated. There must be no illustration which by language or by suggestion or implication is misleading. We do not advertise remedies which time has proved to be useless. In the case of compound remedies we must know the names of their active ingredients, though not necessarily for publication. We are particularly critical in the case of remedies which are advertised to the general public. Where we, or our readers, take exception to the character of an advertisement we write to the manufacturers pointing out the statements to which objection has been taken and asking their cooperation in revising them. We are glad to say that the vast majority of the manufacturing drug houses we approach receive our criticisms in a friendly spirit. They seem genuinely desirous of making their advertisements acceptable to the profession, and realize that when their statements do not carry conviction they are of little value.

That the better-class manufacturing drug concerns realize that it is to their interest and indeed a duty that they owe to the public to see that their advertisements do not advance false claims is shown by the fact that some eighty proprietary medicine firms associated with the Proprietary Association of Great Britain have formulated a code of basic principles which they have bound themselves to observe. These are:—

"1. No advertising must contain any matter which in any way departs from truth as to the character of the product or its suitability for the purposes for which it is recommended. Further, no untruthful implications should be imported into any advertising matter.

2. No advertisement should contain any matter which could be regarded as a holding out for the prevention, cure or relief of serious diseases which should rightly be under the care of a medical man, and, in particular, in accordance with the undertaking required by the rules of the Association, no member shall:—

(1) Advertise or offer for sale to the public any medicine or treatment which is directly or by implication held out as being effective for the treatment of Bright's disease,

cancer, tuberculosis or consumption, diabetes, epilepsy, fits, locomotor ataxy, lupus or paralysis, or for preventing any of those ailments or for producing any beneficial effect with respect to the course of any of those ailments; for the cure of amenorrhœa, hernia, blindness, or any structural or organic ailment of the auditory system; for procuring the miscarriage of women; for the treatment of habits associated with sexual excess or indulgence, or of any ailment associated with those habits.

(2) Publish or cause to be published any advertisement or send or cause to be sent to any person any circular which contains an intimation that he or they is or are prepared to diagnose by correspondence, diseased conditions or any particular diseased condition in a human being, or to receive from any person a statement of his or any other person's symptoms or ill-health with a view to advising as to, or providing for the treatment of, such ill-health by correspondence; or to treat by correspondence any of the ailments specified in paragraph (1) above."

We should like to see something of this sort here.

A.G.N.

Editorial Comments

Periodic Health Examinations

Ten years ago the Canadian Medical Association organized a Department of Periodic Health Examinations. Working in cooperation with a number of insurance companies of Canada, arrangements were made whereby a complete physical examination was made available to a certain number of policy holders, the examination being carried out by the doctor of choice, to whom was paid a fee of $4.00. Later on, this fee was increased to $5.00.

Having demonstrated the usefulness of the service, an independent organization was set up in 1931, known as the Canadian Medical Institute, Dr. H. M. Harrison being appointed Director. During the past eight years, more than 3,000 Canadian doctors have participated in the work, receiving in the aggregate more than $200,000. Approximately 7,000 examinations are made yearly for each of which a fee of $5.00 is paid. According to the best information available to us, the participating Insurance Companies, policy holders and the medical profession engaged in this service are highly pleased.

It was a privilege for the Canadian Medical Association to be responsible for the organization and development of this program which apparently is of real value to many Canadian people.

T. C. ROUTLEY

Sterilization in California

The Human Betterment Foundation of California for some years have been studying the results of sterilization in California State Institutions, and have now issued a report of their findings.* Eugenic sterilization has been systematically enforced in California since 1909, and in that State they have sterilized nearly as many persons as have been so treated in all the other States put together. The first study of results covered a group of 6,000 patients, and the facts revealed encouraged the view that sterilization was a protection rather than a punishment, that no untoward results occurred, and that the difficulties anticipated did not develop.

The latest study covers about 8 more years of experience in this work and includes several thousand more operations. It supports in every respect the original conclusions that sterilization is effective in checking the multiplication of the feeble-minded, and lessening the destructive results of parenthood in families handicapped by mental disease. The compulsory sterilization applies only to those admitted to state institutions for the insane or feeble-minded, and only to a selected number of these. Those are selected who are not likely to stay long in hospital, and therefore need the operation as a protection to their families and society generally. Many such patients have expressed their gratitude at this relief. It was found that only one out of every seven who could be followed up had raised any objection, and in no instance was it based on rational grounds.

The largest group of patients came from the ranks of vagrants, unemployables and unskilled labour. The fact that two-thirds of those sterilized were committed as insane, whilst only one-third were committed as feeble-minded, is because, like all the other States, California makes better provision for its insane. The actual and potential danger of the enormous numbers of feeble-minded outside of institutions is commented on.

These studies fully justify the conclusion that sterilization must be included as indispensable in the struggle against mental disease, deficiency and dependency.

H.E.M.

* Twenty-eight Years of Sterilization in California. P. Popenoe and E. S. Gosney. 47 pp. $0.25.

Special Articles

"FLYING DOCTORS" IN AUSTRALIA

BY J. McF. ROSSELL

Sydney, Australia

The request for some notes on the Australian Aerial Medical Services is considered a compliment to this Dominion, and I will attempt to set down some facts which may interest our Canadian colleagues.

The idea of medical aid travelling by air was first carried into effect by that great superintendent of the Australian Inland Mission, John Flynn ("Flynn of the Inland"). On his long patrols in the central and northern parts of Australia he realized the need for medical attention to the isolated settlers, the telegraph operators, the police on their long travels, station managers, and many other people in the "outback", to say nothing of the numerous aborigines inhabiting these districts. Under Flynn's guidance this Mission established hostels in 1912 which were staffed by two trained nurses, and thirteen of these are now scattered about the lonely parts of the continent. Welfare huts have also been built after the style known during the Great War.

In 1928 the first "Flying Doctor" service was inaugurated, having its base at Cloncurry in north-west Queensland. For some years before this experiments had been going on to perfect a cheap wireless receiving and transmitting set which would be simple in operation. In 1929 such sets were installed, and they proved so efficient that there are now many in use throughout the length and breadth of the Continent. They are called "Transceivers" and they cost about £70:0:0 each. The power for transmitting is produced by a generator worked by foot-power through cycle pedals. They are virtually invaluable in connection with the "flying doctor's" work, as telephones are few and far between where the doctor is most needed.

As the writer's experience has mostly been gained at this Cloncurry centre, perhaps it would be best to describe the conditions existing there in 1934, and which obtain at the moment. This service, with a satellite base at Croydon which, commenced in 1937, is still carried on by the Australian Inland Mission (A.I.M.); but later bases, established at Wyndham and Port Hedland in Western Australia and at Broken Hill in New South Wales, are conducted by an organization known as the Australian Aerial Medical Services, which is a commonwealth-wide body. It is a public association whose units comprise the Country Women's Association, the Rotary Club, British Medical Association, various Aero Clubs, the University, and the Wireless Institute, and it enjoys both Federal and State Government assistance. Each of these bases serves an area having a radius of about 350 miles, so that when the proposed service at Alice Springs, in the centre of the Continent, is inaugurated the whole of that part of Australia which was previously without adequate medical service will be covered.

The success of the work depends almost entirely on the wireless organization. The "Mother Station" is located in a town with good hospital facilities, as many cases need transportation to hospital. The service rendered is more than merely first-aid treatment; it attempts to give the very best in medical care.

The medical work in such a service can be compared with a country general practice, excepting that one flies to the patient and is called-up by radio. The "Mother Station" is in daily contact with some forty or fifty pedal "Transceivers", and any one of these may want advice about the many illnesses and emergencies which occur with special frequency on a cattle station in the tropics. At one moment one may be speaking (and almost all the work is now done by wireless telephony, although until recently it was by Morse telegraphy), to a police station 700 miles south-west and the next to an island 400 miles away, off the coast of northern Australia. The conditions treated by advice over the air range from a fractured leg to gastro-enteritis, and from malaria to pneumonia. This method of advising treatment of a fracture of the shaft of the tibia may appear at first sight fantastic, but when one realizes that the patient's wife is a trained nurse, that the homestead is about 700 miles from the base, and that the flying country in between had been described as "impossible", the practicability of the system becomes apparent. The patient's wife had splints made under my instructions and, with the man under morphia, she reduced the fracture in which there was apparently little displacement. I was in touch with her daily for some weeks and continued to keep the patient "under my care" until he returned to his work among the cattle again. Such things happen frequently in this "practice" and there is no lack of interest in the work. In the cattle country around the Gulf of Carpentaria there are many serious accidents, and within a few months I saw five fractures of the skull, mostly due to accidents with horses or bullocks. Such patients are transported to the base, where they receive adequate hospital attention.

One feature of transportation by air is the comfort in which the patient travels. He may be brought to the aeroplane over a rough road by motor truck, where every yard of the journey is painful, but as soon as the aeroplane leaves

the ground he is more comfortable than under any other form of travel. The type of machine most used is the English Fox Moth, the fuselage of which is modified to take a stretcher. The cabin holds besides the doctor another patient or passenger.

On longer trips the wireless operator from the Mother Station, or his assistant, usually accompanies the doctor with a portable pedal transceiver, and he is thus able to keep in touch with the base whilst in the air. One instance of the value of this occurred when I was on a trip of 600 miles. A message sent from the hostel where the patient was to the base station was sent on to us whilst in the air, and I ordered urgent treatment which carried the patient on until our arrival, when, with the help of the two nurses, an operation was performed. As no aeroplane or doctor had ever been at this spot before, many of the people of the district came in to get small matters attended to. These involved dental advice, attention to children's throats, and all the other matters one meets in general practice. On the 600 miles trip back calls were made at two other small towns where there was no doctor, and again advice and treatment were given to many of the people of the district.

A rule has been adopted that no call shall be attended within 50 miles of a practising doctor, unless at his specific request. There are many small towns in the area covered by the Cloncurry service without a doctor, and regular visits are made to some of them, perhaps monthly or quarterly.

All the station homesteads have a good landing ground within a mile or so of the house, and this applies also to police stations, townships, telegraph stations, and boundary riders' huts. In some districts the people regard a good landing ground as being of as great importance as a roof over their heads. The service has come to be a part of the life of the people, just as the general practitioner is in more populous parts. Its value is being appreciated more and more by the people it serves, and this can be seen by the mileage figures. In 1928 the miles flown were just under 18,000; this figure has steadily risen until in 1936 it was 36,800, and, with the satellite service at Croydon, it was, in 1937, 47,660 miles. The service is carried on at Croydon, in conjunction with the main base at Cloncurry, by a medical woman who is making a wonderful success of the work. The length of the trips ranges from about 100 miles to over 1,200.

It will be seen that there is not necessarily a trip to make every day. The work is most irregular, and the doctor may be in the air daily for perhaps ten days and then not again for three or four days. These latter days are not by any means idle, but are filled by the consultations "over the air" which may have accumulated whilst absent from the base.

It is a rare thing to have to postpone a flight on account of weather conditions, and never on account of aeroplane trouble. The company which has the contract to fly the doctor has a relief plane at Cloncurry, and maintains a staff of mechanics and pilots always ready. The policy of not expecting the doctor to be a pilot also has been found best, and the contract arrangement with an aviation company has proved eminently successful.

Rarely, if ever, do wet grounds prevent a flight, as landing grounds are placed on the highest site available. Occasionally a dust storm will delay a trip for a few hours, but even this experience fell to my lot on one occasion only during the time I was at Cloncurry. The dust storms are considered to be bad in this part of Australia. In matters touching flying conditions the pilot has the last word; a decision as to the urgency of the case is the doctor's responsibility. He and the pilot discuss any proposed trip on this basis.

Another part of the work associated with the service is consulting with and giving assistance to medical men practising in the area. One day may be spent in a 700 mile trip, having for its object a consultation at one town and an operation or anæsthetic at another. All branches of medicine are practised, including midwifery, and not always under the best conditions, but the policy of transporting patients to the nearest hospital and occasionally to the capital cities (sometimes even 1,200 miles away) brings to the people of the "outback" the best possible medical service. The medical men in the areas served are not only unantagonistic, but they welcome the help they are able to receive. The mission stations of the northern coast of Australia frequently obtain advice over the air, and many trips are made to them in attending the white residents and the natives under their care. These latter are particularly susceptible to influenza and pneumonia, and they also suffer considerably from pulmonary tuberculosis, yaws, and malaria.

A very important result of this service is the feeling of medical and surgical security now enjoyed by the isolated people of the Continent; this has resulted in sheep- and cattle-men and miners taking their women-folk and children confidently to places where they would not have felt safe before. The wireless has removed much of the loneliness from their lives, and they are able to converse at will with their neighbours (perhaps 200 miles away) and to speak daily with the base station, and through it by telegraph to the rest of the world.

The comparatively small number of patients attended may appear to be out of proportion to the amount spent, but when the immense distances, the lives saved, and the feeling of security engendered are taken into account, the "Flying Doctor" service is amply justified.

DIET AND NUTRITION

NUTRITION AND RESISTANCE TO DISEASE*

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XIII

Nearly a hundred years ago Graves wrote, "Want of a sufficiency or food of an unwholesome or an improper character predisposes the human frame to disease by its debilitating effect on the system". It is interesting to note that some physicians in the past recognized and emphasized the rôle of nutrition in the maintenance of health and resistance against infection. No one now questions the rôle of proper nutrition in resistance against disease. From a clinical standpoint, possibly most of us think of it in terms of under-nutrition rather than of mal-nutrition. The difficulty of obtaining clinical evidence of the effect of minor nutritional deficiencies is obvious. The story is entirely different however in regard to animal laboratory experiments where all conditions can be adequately controlled.

There is evidence that a lack of almost any one of the 32 food elements essential for animal nutrition will result in a lowered resistance to infection. A number of experiments giving evidence of this nature have been reported by one of us (E.C.R.). The procedure developed was to feed animals with a measured amount of a disease-producing organism and note the number of animals that survived. This sounds like a very simple procedure, but actually it constitutes a most difficult and time-consuming experiment. A suitable disease-producing organism had to be first obtained. After a number of trials, an organism called *Salmonella muriotitis* (rat typhoid) was found to be suitable for this type of study. It was comparatively harmless for the human being, but in suitable doses was found to be pathogenic for the rat and yet not so severe in its effect that it invariably killed all animals. When death occurred it was preceded by marked diarrhœa, cyanosis, and a bloody discharge from the nostrils. Blood cultures were taken aseptically from the hearts of all the dead animals and the organism was regularly recovered, usually in pure culture, indicating that the rats had a muriotitis septicæmia when they died. The animals were observed for 28 days after the infecting dose, when the experiments were terminated, and those that lived for this length of time constituted the survivors. When death occurred it usually was within the first ten days. The degree of resistance was estimated by the percentage of survivors in each experiment. In every case the experimental animals were fed a diet adequate in all respects with the exception of the factor or factors being studied. Control litter mates were fed the same diet with the addition of the substance under study.

In Table I is shown the effect of lack of vitamin A on resistance to infection. It is to be noted that when the diet was deficient in this vitamin only 40 per cent of the animals survived as compared to a survival rate of 79 per cent in the litter mates who were fed the same diet with added vitamin A, in the form of its precursor, carotene.

TABLE I.
THE EFFECT OF A LACK OF VITAMIN A (CAROTENE) ON RESISTANCE TO INFECTION

Vitamin A deficient diet	
No. of animals	10
No. of survivors	4
Survivors	40 per cent
Vitamin A deficient diet, plus 0.5 per cent. carotene solution	
No. of animals	14
No. of survivors	11
Survivors	79 per cent

In Table II it is seen that when the diet was lacking in the vitamin B complex 20 per cent of the animals survived, as compared with a survival rate of 72 per cent when the diet was perfect in all respects.

TABLE II.
THE EFFECT OF A LACK OF THE VITAMIN B COMPLEX ON RESISTANCE TO INFECTION

Vitamin B deficient diet	
No. of animals	79
No. of survivors	16
Survivors	20 per cent
Vitamin B deficient diet plus 6 per cent yeast	
No. of animals	72
No. of survivors	52
Survivors	72 per cent

Similar results were obtained, as shown in Tables III, IV and V, when the diets were lacking respectively in vitamin D, minerals, and animal protein. In Table V it should be noted that the first lot of animals received their protein from grain sources, while the control animals received their protein largely from milk casein. This is evidence in favour of the advisability of including in the diet each day a certain proportion of protein as *animal* protein, namely, meats, fish, poultry, eggs, milk and cheese.

In considering the percentage of survivors in Tables I to V, no comparison should be made

* From the Department of Pædiatrics, University of Toronto.

This is the thirteenth in the series of articles on Diet and Nutrition prepared under the auspices of the Association's Committee on Nutrition. The previous articles can be found in the *Journal*, 1938, **38**: 277, 387, 491, 586; **39**: 76, 179, 280, 389, 483, 578; 1939, **40**: 77, 174.

TABLE III.
THE EFFECT OF A LACK OF VITAMIN D ON RESISTANCE TO INFECTION

Rachitogenic diet	
No. of animals	375
No. of survivors	106
Survivors	28 per cent
Rachitogenic diet plus Vitamin D	
No. of animals	364
No. of survivors	201
Survivors	55 per cent

TABLE IV.
THE EFFECT OF A LACK OF MINERALS ON RESISTANCE TO INFECTION

Diet very low in minerals	
No. of animals	63
No. of survivors	34
Survivors	54 per cent
Diet adequate in minerals	
No. of animals	61
No. of survivors	53
Survivors	87 per cent

TABLE V.
THE EFFECT OF A LACK OF ANIMAL PROTEIN ON RESISTANCE TO INFECTION

Normal diet with 17 per cent wheat gluten	
No. of animals	40
No. of survivors	23
Survivors	57 per cent
Normal diet with 17 per cent casein	
No. of animals	41
No. of survivors	37
Survivors	90 per cent

between the number of survivors in one table with the number of survivors in another table, because with each set of experiments it was necessary to regulate the dosage of the *Salmonella muriotitis*. This was necessary because there was a variation as the experiments proceeded in the degree of virulence of the organism. However, in every individual experiment the conditions of the control animals and of the experimental animals were identical, with the exception that the diet in the experimental group was lacking in the factor or factors being studied.

In the experiments the conditions were naturally quite severe, in that the deficiencies produced were very marked. One might say that deficiencies of this degree would rarely if ever be encountered under Canadian dietary conditions. Further studies were then made in which the degree of the deficiency in the diet was comparatively slight. The results obtained in one set of experiments are given in Table VI. It is seen that with this lesser degree of deficiency there is still a marked difference in the resistance of the two groups of animals against disease. These studies with animals furnish clear-cut evidence that improper nutrition

TABLE VI.
THE EFFECT OF A PARTIAL LACK OF THE VITAMIN B COMPLEX ON RESISTANCE TO INFECTION

Partial vitamin B deficient diet	
No. of animals	30
No. of survivors	6
Survivors	20 per cent
Same diet plus vitamin B	
No. of animals	38
No. of survivors	33
Survivors	87 per cent

lowers the resistance of the animal to infection and also that the nutritional deficiency does not have to be so severe as to produce outstanding evidence of disease.

With this laboratory evidence in mind, that a nutritional deficiency will result in a lowered resistance to infection, how are we going to feed our sick patients? If the illness is an acute one of short duration, simply a matter of 3 or 4 days, this question is not urgent. However, it is obvious that if the patient is suffering from any disease that lasts more than a week or so, special attention must be given to his nutrition as a whole. Strange as it may seem, this is frequently neglected. Recent work has indicated that the presence of any infection increases the need of the body for many of the food elements. To give only three examples; it has been shown that the amount of vitamin A and vitamin C in the blood is markedly lowered by infection, and there is evidence of an increased need for vitamin B_1.

The physician's duty to his patients, however, should not stop with just the treatment of the acute or chronic illness. When the patient presents himself with even some minor infection, our interest should be aroused as to why the infection developed. Was it the result simply of a focus which could have been removed or treated, or have the patient's habits been such that he is not enjoying the highest level of resistance? Probably the most important of these habits are his habits of nutrition. The remarkable adaptability of the body is such that a person may have a nutritional deficiency for many years before it clearly evidences itself. In the interval, however, the patient will not be enjoying the highest possible level of health and resistance against infection.

One should not expect that infections can be completely prevented by dietary means. This, of course, is impossible, and with many diseases there is no evidence that nutrition has any effect on the susceptibility of the patient to the disease. However, from clinical observations, there is no question that with proper nutrition the patient's resistance to disease is maintained at a high level and that he will "throw off" or recover from his infection more often and more quickly than the one who is malnourished.

One cannot lay down any rules as to the nutritional treatment of a patient during illness.

However, when the patient has recovered, and there is no specific contraindication, his food should include each day a pint to a pint and a half of milk for children, one-half pint for the adult, some meat, one egg daily, two liberal helpings of vegetables besides potatoes, some raw fruit or vegetables, and, during the winter months, some source of vitamin D. If this is done, you will be assisting your patients to reach that goal which we all desire, namely, optimum resistance against infection and optimum health.

Medical Economics

HEALTH INSURANCE AND ASSOCIATED MEDICAL SERVICES INCORPORATED*

BY T. L. FISHER, M.D.

Ottawa

When I was asked to speak to you it was suggested I should speak on Health Insurance or Associated Medical Services Incorporated. It seemed to me that the more pertinent subject at the moment was Associated Medical Services Incorporated. It became apparent at once, however, that at least a cursory knowledge of Health Insurance was necessary for the understanding of Associated Medical Services Incorporated, so the remarks I prepared were neither one nor the other, but a jumble of both. Then came a letter from Dr. Kelly in Toronto stating the subject finally and I found that my choice was just what he asked for.

Before proceeding farther I would like to pay my debt of gratitude to Dr. T. H. Leggett, Past-President of the Canadian Medical Association and Councillor for District No. 8 of the Ontario Medical Association for his very valuable help in the preparation of this paper. Dr. Leggett's knowledge of the subject of Health Insurance is extensive and accurate, and without his help much of this paper would have been impossible for me.

One point, responsible for a great deal of confusion, should be cleared up before beginning any discussion of health insurance. That is the difference between state medicine and health insurance. The terms are used synonymously so often that it is easy to think of them as the same thing unless care is taken to emphasize the difference between them. This is unfortunate, because state medicine is the form of group medicine to which the profession is justifiably antagonistic, and unless we understand clearly that health insurance is different we make it the object of unjustifiable antagonism. State medicine is exactly what its name implies, medicine controlled by the state. The number of doctors practising, where they shall practise, and the work they shall do are all controlled to some extent by the state. Free choice of doctors by patients may be neglected. Patients may to told by the state which doctor they shall consult, and salaries are paid by the state. Health insurance on the other hand is simply group medicine, and, if properly managed, possesses few of the disadvantages of state medicine. No doctor need see insured patients unless he wishes, and patients may choose any doctor they wish. One further differentiation should be made, that between voluntary and compulsory health insurance. In the former a health insurance scheme is set up and people may or may not join as they wish. In the compulsory form it is usual for a government to force all persons having incomes below a certain level to pay into the scheme and belong to it. It is interesting to note in this connection that voluntary health insurance has never proved the unqualified success that the compulsory form has. Every country that has had a voluntary system of health insurance has changed to a compulsory scheme and has been more satisfied after the change. Do not be misled by the name, a scheme may be health insurance, and therefore without the disadvantages of state medicine, and still be compulsory, the compulsion being exerted only to make certain groups of the people belong.

The history of health insurance is much longer than most of us realize. In Belgium, France, and Great Britain there have been voluntary systems for about 100 years. In all three countries the systems were not satisfactory, in that too few people took advantage of them. The provident persons who, because they were provident, would probably pay for their own care anyway joined when they realized the benefit to be derived from the insurance. The improvident ones who would not look after themselves because of their improvidence could not see the value of health insurance. This fact so limited the benefit obtained that Great Britain introduced a compulsory scheme in 1911. Belgium has recently introduced compulsory health insurance and France did it in 1930. In Germany voluntary health insurance was in existence from 1883 until the advent of Hitler in 1934, when it was made compulsory with everything else. Denmark's system began in 1892 and was made compulsory in 1923. Thus it is evident that if we are to consider health insurance we have a wealth of experience from other countries on which we can draw.

Both voluntary and compulsory health insurance may vary in another particular, the extent of the service they offer. Satisfaction

*Presented to Prescott County Medical Association, O.M.A., at Hawkesbury, Ont., on October 11, 1938.

from either scheme varies directly with the extent of services. In countries where it is inclusive it is very satisfactory and where some parts of medical service are excluded it tends to be less so. In Great Britain, for example, hospitalization is not included, nor consultant service, and the general comment there is that the health insurance act would be much more satisfactory if these were included. In Denmark health insurance is compulsory, the rates charged are sufficient to pay for an inclusive medical service so that all persons below the given earning power receive whatever medical attention they need. Denmark is the one country where there is universal satisfaction with health insurance. The people and the profession alike feel it is as good as possible. It is of interest, further, that health insurance plans have proved more satisfactory when under the control of the medical profession or when the profession has a large voice in their control.

There are, at present, forty countries that have health insurance, and no country which has ever had it has allowed it to lapse. This is true of the medical profession in the various countries as well as for the population at large. In Great Britain there was great antagonism on the part of the profession to the establishment of their scheme, yet today the profession is solidly in favour of it, and the British Medical Association is officially so. It is said that in Great Britain the two greatest stabilizing factors in the past ten years have been unemployment insurance and health insurance. State medicine has not proved such an unqualified success and complaints were heard in countries where it existed, with the exception, of course, of Germany where complaints are not allowed.

Against this historical background I am now going to try to place certain facts and conditions which have been and are arising in Canada and which focus our thinking on this problem.

It is no news to you that when the depression started the country districts in the Prairie Provinces began to find themselves without doctors. The people had no money, doctors could not collect accounts and were forced to leave. In many cases municipalities stepped in and offered the doctors a certain minimum income sufficient to live on, with the privilege of collecting whatever they were able in addition. In that way these districts retained medical men they could not have had otherwise. Once started, the number of districts that did it increased rapidly, and, if reports from the West are reliable, it is proving a very satisfactory arrangement for the people. It is less satisfactory for the doctors, as the municipal salary is always low and people use the fact that the doctor is getting a salary as an excuse for refusing to pay fees which some of them can well afford. As a matter of interest in this connection it can be said that no health insurance scheme has been wholly satisfactory to anyone if the medical profession was unsatisfied.

None of you need to be reminded about the abortive attempt made by British Columbia to foist a system of health insurance on the public. Only the unanimous opposition expressed by the doctors of the province prevented an unsuitable scheme being started. The scheme was quite unsuitable because it included only certain wage groups who were able to pay usual medical fees without the insurance, and who, when included, would have received medical service at much less cost. Further, the scheme did not include indigents or unemployed whom the doctors were expected to look after without remuneration, as in the past.

These developments were being watched by the leaders of the medical profession. The success of health insurance in the countries which have it, and the obvious need for it in certain parts of Canada, forced our leaders to the conclusion that we, the profession, should acquire as much knowledge about health insurance as possible. At present the opinion is held in many quarters that some form of health insurance is an inevitable development in Canada. What should the attitude of the profession be to it? From its wealth of experience the British Medical Association gives the following advice. The profession must learn about health insurance. The whole profession must join the official medical association so there will be an informed, organized body able to speak for the whole profession. If the medical association deems it wise it may initiate steps in the direction of insurance, but in any case it must be fully prepared to give intelligent and informed guidance to the country when it is evident that it is going to start a system. In other words, if we think it wise, we can agitate for a system of health insurance, but, if not, we must be ready to lead off if the system is coming anyway, or we will be kicked into it on disadvantageous terms. Only thus can the two important phases of the development be assured, that is, the development of a wise inclusive scheme and the assurance that it will be satisfactory to the profession which is most vitally interested.

Now I think we are ready to discuss conditions in Canada which have given rise to the idea that we may need health insurance. In Canada, from a medical economic point of view, the population may be divided into certain fairly definite groups. The two most definite and clear-cut, naturally, are the wealthy and the indigent. The former can obtain without any difficulty whatever medical attention is necessary and do not need to be considered further. The indigent are unable to pay for medical services, are indeed unable to pay for any essentials, food, habitation or clothing, and, because insurance is on a basis of contribution by the individuals concerned and because they

cannot contribute, they may be neglected in this discussion. Between these groups lies the vast bulk of the population. Of these a few can well afford medical services. Another small number can probably afford only a part, leaving a still larger number who pay for medical attention only with difficulty. Most of them are below what I choose to call the "medical subsistence level". To illustrate this it is only necessary to quote the figures supplied by the Dominion Bureau of Statistics of Canada. There we find that 78.8 per cent of the people in Canada have incomes less than $1,449 a year. More startling still, 94 per cent have less than $2,949 per year. $1,449 does not allow much serious illness, unless the family has some way of saving for it in advance, and it is for this large group of nominally self-supporting persons that health insurance is being considered. For a small salaried family to be financially prepared for illness is almost impossible, as illness is unpredictable. It may be frequent or occasional, long or short. But it does become possible to budget for it if a number of individuals, a group, is being considered. There the law of averages begins to work. For example, the cost of illness to an individual who is a member of a large group is $24.00 annually. This is arrived at from the following table compiled by the Associated Medical Services as a result of study over a four year period.

	Each
Home calls—1 per person per year	$3.00
Office calls—1.5 per person per year at $2.00.	3.00
Surgical operations—0.8 per person per year at $50.00	4.00
Consultation and specialist cost per person per year	4.00
X-ray and laboratory work	1.00
Hospitalization—1.3 days at $3.50 per day	4.50
Nursing—0.05 days at $5.00 per day	2.50
Administration	2.00
Total	$24.00

Now to begin and apply all this to ourselves. The Ontario Medical Association has been particularly aware of these facts and opinions. As long ago as 1934 a committee on health insurance was appointed. A detailed statement of their investigation and all the subsequent action taken is not necessary, except to state that as one result of this committee's activities a system of voluntary health insurance called The Associated Medical Services Incorporated was formulated. One name in particular should be mentioned here, that of Dr. J. A. Hannah, who is at present Chief Medical Officer of Associated Medical Services. Dr. Hannah did a tremendous amount of preparatory work on this question, and it was to the committee on which Dr. Hannah acted that the Ontario Medical Association made its grant of money to get the plan started in one test district. The district chosen was Toronto.

Associated Medical Services Incorporated was given the official blessing of the Ontario Medical Association for two reasons. The first was that it seemed that it could offer to suitable persons and groups a means of providing for their medical attention in a much easier and more complete manner than they possess now. The second was that it would provide the Ontario Medical Association with some actual figures of the cost of medical care in Canada on which to base its opinions should any of the governments of the Dominion decide to institute such a scheme. For these reasons the Ontario Medical Association made a grant to Associated Medical Services sufficient to cover the expenses of inauguration of the services. Associated Medical Services is not under the direct control of the Ontario Medical Association, but is, as it were, a step-child for which Ontario Medical Association has accepted some responsibility. Associated Medical Services is incorporated in the Province of Ontario as a non-profit, mutual, organization with its head office in Toronto, and with the privilege of forming branches elsewhere in Ontario if these are desired.

So that it will have been discussed and will be out of the way, I will tell you now the rates charged patients and the fees paid doctors by Associated Medical Services. To join costs a patient $2.00 a month, $24.00 a year. Because the cost of medical attention for a family is less per individual than the same number of separate individuals it is possible to reduce the charge to a family. It is done as follows: $2.00 for the wage earner, $1.75 for the first dependent, $1.50 for the second, $1.25 for the third and $1.00 for the 4th and each other dependent. Dr. Hannah has repeatedly emphasized that the Associated Medical Services is at present in what may be called an experimental stage. No proved figures are available to show the cost of medical care in Canada, so these rates are based on estimates such as those given a short while ago. Partly for this reason the scale of fees to medical men is somewhat lower than those often charged patients in the medium and higher income classes. Associated Medical Services pays participating physicians the minimum rates of the Ontario Medical Association tariff. It should be stated here as well that the main outlines of Associated Medical Services have been carefully laid down and will probably not change a great deal, but due to the uncertainty about medical costs in Canada it is possible there will be changes in subscribers' rates, fees paid to doctors, as well as benefits offered by the Association. This cannot be definitely stated now, but should be borne in mind.

It seems proper next to make an attempt to define the scope of services offered by Associated Medical Services. First, the negative aspects of the services. The Associated Medical Services does not offer any services

that patients can get at present (and commonly do get) through Ontario Provincial institutions. That is, no responsibility is accepted by the Associated Medical Services for injuries which are looked after by the Workmen's Compensation Board; for institutionalized insanity in any form, for institutionalized tuberculosis, nor for venereal disease. The reason is that adequate provision is made for these under the present system. If they were included rates would have to be needlessly higher. Medicine prescribed for patients who are receiving treatment outside hospitals is excepted. The reason for this I will state later. Annual health examinations also are excepted for a reason that will shortly become obvious. Prior and continuing illness is naturally not accepted.

Now for the positive side, and I would ask you to note particularly the scope of services offered. With the foregoing exceptions Associated Medical Services offers its subscribers a complete essential medical service. Now let us analyze that statement. First "complete". This means exactly what it says. There is no branch of regular medicine which is excluded, medicine, surgery, obstetrics, anæsthesia, ophthalmology, otolaryngology, x-ray, consultations, hospitalization, and special nurses when necessary. I have missed some, but not because the Associated Medical Services omitted them, simply that a complete list would be too long. It means this, that once having become a subscriber there is no illness a person can have which will not be paid for by the organization, not forgetting of course those I mentioned first as exceptions. Then "essential". Your first reaction to this may be that here is the catch. It is not a catch, it is not even a qualification, it is simply an explanation. As I said earlier, this service is not designed for the rich patient who expects to be visited each day while he has a mild cold; it is designed for the patient of moderate means to provide him with such medical services as are ordinarily necessary. Therefore, calls, if they are to be paid for, must be such as would be made by a doctor for a given patient who did not belong to the Association. The essential nature of the services is the reason annual health examinations such as the insurance companies offer to their policy holders are excluded. They may be wise, but are not considered "essential". Put in short form, all services which are necessary for a patient because of illness are included in this scheme.

Now I will deal with the exception of the medicines. First I would like you to notice that medicines used in hospital are paid for up to a total cost not exceeding fifty cents per day for the total period of the patient's hospitalization. To explain the exception of medicines outside hospital it is necessary to go outside Canada for a moment. In Great Britain the form of health insurance is slightly different in England and Scotland. In Scotland, speaking generally, patients go to doctors expecting advice primarily, which after all is what doctors should give, and medicines only if those medicines necessarily supplement the treatment advised. Because the patients have to pay for their medicines themselves they are less likely to feel that their consultation was valueless if no medicine was given; they are more inclined to feel the advice is the most important part of the consultation. In England, on the other hand, a different estimate of doctors' services has been arrived at. There, if the doctor does not give his patient a bottle of medicine the patient feels the visit may not have been worth while. As one man put it, the patient expects a bottle of medicine and a little advice around it like a wrapper. The medicine is paid for by the scheme and why shouldn't he have it? The result has been that the costs of medicine as a part of the medical care of the people are twice as high as in Scotland. It was felt that when a scheme such as this was starting in this country knowledge gained from other schemes should be used, and it is hoped that making medicines an exception to the services paid for by the Association will tend to limit the amount of medicine prescribed to that amount which is necessary, and will therefore prevent the prescription of bottle after bottle of medicine, just because the doctor is afraid his patient will think he is a poor doctor if he does not issue a prescription every time he sees him.

I think now we have arrived at the time when we may explain the steps taken to have a branch of Associated Medical Services Incorporated set up in a town or district. An important fact about the whole Associated Medical Services should be explained here. It is a basic principle of the organization that the final control be in the hands of the medical profession. I am not going into detail about the constitution of the corporation proper or the branches, except that on both these bodies doctors predominate numerically so that they can always be in control. The feeling is carried further in that Associated Medical Services will not even consider opening a branch in any district until the local medical association has made a request for its establishment. The easiest way for me to explain the formation of a branch is to tell you how the Ottawa Medico-Chirurgical Society obtained the Ottawa branch. Considerable discussion had taken place among the physicians of Ottawa as a result of hearing about the Toronto results. No definite action was taken by the Medical Society for some time. Enquiries began reaching the head office of the Associated Medical Services in Toronto from Ottawa laymen, how did the Medical Services act? how could people in Ottawa district get a branch? how could they join? and other similar questions. These letters and his answers to

them were forwarded by Dr. Hannah to our medical society. In reply to the enquiries Dr. Hannah stated he hoped a branch would be formed in Ottawa, but that the local medical association would have to issue an invitation before this could occur, and he advised those interested to consult members of the local medical group. Enquiries then began to reach us from patients who were prospective subscribers. Eventually the matter was brought up at an executive meeting and then at a full meeting of the Medical Society. After considerable discussion it was decided to request Dr. Hannah to come to Ottawa and tell us about Associated Medical Services. He came, and told us much of what I am trying to tell you, and a great deal more, because his knowledge is much more extensive than mine. More discussion in the Medical Society ensued and Dr. Hannah was brought to Ottawa again for further explanations. Shortly after that the Medical Society issued a unanimous invitation to Associated Medical Services to establish a branch in Ottawa. Then and not till then did they make their decision to come to Ottawa. First, however, certain requirements were laid down to both the Medical Society and to various lay groups interested, and there had to be a minimum number of prospective subscribers to make it financially possible for a branch to start and survive the first few months. When Associated Medical Services received these assurances they finally accepted the invitation. I may say for your information that the head office did not prove a very hard taskmaster, as the required numbers were not available when the office was opened and were not for much too long a time.

Then Dr. Hannah came to another meeting of the Medical Society, told us the steps which had been taken and discussed fully with the Society the Association's needs in Ottawa, and also outlined the places where cooperation from the profession was necessary. At present the growth is steady and satisfactory. Dr. Hannah tells us that this will increase more rapidly when the first few patients have been sick, have recovered, and have found that they have no medical bills to add to their worries after the illness, and begin to talk to their friends. We are hoping this may be true.

What happens when a patient becomes interested in Associated Medical Services Incorporated? He may get further information from the person who first tells him about it, or, and we hope this is more common, he may see his family doctor and make enquiries from him. He is sent then to the branch office where he receives complete and particular information and an application form. No medical examination is necessary. The form is designed much as a non-medical insurance application form is designed, and gives the age, occupation and past history of the individual. At the bottom of the form is permission for Associated Medical Services to obtain any further necessary particulars from any doctor the patient may have consulted in the past. Incidentally, this permission is not only signed by the patient but is witnessed, so there can be no future trouble with any patient about a breach of professional confidence. On the form also the patient must state the doctor of his choice, and he is told that thereafter he must stay with that doctor until he notifies Associated Medical Services that he wishes to change.

The application form is sent to the branch office where it is studied by the branch medical secretary. If necessary he will ask for further information from any of the doctors mentioned on the application form. If he thinks the patient is not a suitable applicant he so informs him and that ends the matter. If, on the other hand, the patient is judged suitable the branch medical officer notifies the doctor that he has been chosen by that patient as his physician. The card carrying the notification also asks the doctor if he knows any medical reason why the patient is not a suitable person to become a subscriber. If the doctor does know any such reason he merely returns the card unsigned to the office and the patient is informed that he is ineligible for membership. If, however, the doctor signs the card it means the doctor is willing to act as that patient's medical adviser, and that he thinks the patient is suitable. The patient is then notified that he may obtain medical attention through Associated Medical Services after two months' membership and for as long as he pays his dues.

It is hoped that in the ordinary course of events a subscriber will continue well and will continue paying his monthly dues for an indefinite period of time, indeed, that that will be the only contact Associated Medical Services will have with that subscriber, both for his and their sakes. However, we will take it that eventually the subscriber becomes sick and calls on the doctor of his choice. He receives from the doctor whatever services may be necessary, he recovers, we hope, ultimately returns to work, and, financially, forgets that he was sick.

Now for the doctor. It may be presumed that he was interested in the formation of the branch office and so is prepared in his own mind when he receives a letter from Associated Medical Services stating that a branch has been opened in his town and drawing his attention to an enclosed form. This form is the doctor's application to be enrolled by Associated Medical Services as a participating physician. He reads it over and notes that he must be willing to abide by the rules and other things of the same kind. This hypothetical doctor signs the application form and returns it to the branch office. Some time after he receives from the branch office his first card stating he has been

chosen by a subscriber as that subscriber's doctor. We hope he will look up his records before signing the card to be sure the applicant-subscriber is a suitable person. He may find that he is not, and, if so, returns the card unsigned. This ends consideration of that particular subscriber, although Associated Medical Services does appreciate a phone call or a short note giving the reason the person is thought unsuitable. The next card he finds is from a suitable person, so he signs it and returns it. With it will come a larger card which the doctor may retain as a record that this person has become a subscriber and is depending on him.

Some time later this subscriber becomes ill. He phones his doctor in the usual way, and, as usual, the doctor undertakes his care. Just now we will suppose the illness to be a comparatively minor one from which the patient recovers before the end of the current month. Before the tenth of the following month the doctor renders his account to Associated Medical Services at the minimum rate laid down by the Ontario Medical Association. The account is paid and that is the end of that. Suppose, however, that the patient when he comes has a condition requiring the services of a specialist. The doctor refers him to the appropriate specialist, and at the end of the month when he renders his bill states on it that the patient was referred, as well as to whom. In the case of surgery Associated Medical Services retains control to the extent that they ask for a consultation before an operation can be performed. This is for their own protection as well as for the protection of the patient, and while it seems to interfere slightly in the usual doctor-patient relationship it is obviously necessary. If the condition from which the patient is suffering is unusual or serious and the doctor wishes a consultation Associated Medical Services requires that the branch medical officer be notified before a consultation is ordered, this merely that the need for a consultant may be established properly.

Now, if I have made myself clear in this short summary, it should be obvious that the scheme of services offered by Associated Medical Services Incorporated is about as perfect as a new scheme of this kind can be. Most of us who have been interested in it feel that no flaws have been discovered yet. We are further pleased with the emphatic declaration by the present management that when flaws are discovered they will be remedied. There is no change in the relation of patient to doctor or doctor to patient. The scheme retains free choice of doctor by the patient and gives the doctor the same privilege he now has to accept or refuse a patient. No third person intervenes between the two. When ill the patient calls the doctor directly, the doctor, without reference to anyone else, goes and attends his patient. The one difference, and it is the basic reason for the whole organization, is this. The patient has paid for his medical services in advance and can have whatever is necessary for diagnosis or treatment without having to worry about paying bills in the future. The doctor, when the illness is finished, renders his bill to the corporation instead of the patient, and receives his money immediately instead of at any time in the future that the patient feels he has the money and cares to part with it. It may be granted, I think, that the average income from a certain group of cases will be lower than in usual practice, because the minimum tariff of the Ontario Medical Association is the basis of charges, but this should be more than compensated for by the fact that payment will be in full and will be prompt.

In Lighter Vein

TO E. W. A.*

One more distinction now, I'm told,
Has come to you and you're enrolled
Among the lads whom gay Paree
Has honoured with her best degree
You've now got half the alphabet
Behind your name and may still get
The other half. I'd like to know
Whyever you are honoured so.
You've never plied the little arts
Made use of by some men of parts,
And quite approved of nowadays,
To bring them to the public gaze.
You never kowtowed to the rich
Nor cut the social capers which
Conducive are to getting fame,
By means which do the weak proclaim.
You never published balderdash,
You never sold your soul for cash.
You never bragged or bluffed or lied,
You never were puffed up with pride.
When I consider your career
It seems to me it's rather queer.
Without those aids I don't see how
You ever got where you are now.
You've only brains and industry,
Good breeding, kindness, modesty,
The faculty of making friends
With ne'er a thought to serve your ends;
Sound judgment, sympathy, and skill
To comfort and to heal the ill.
With such inferior gifts as these
You've earned your fees and won degrees,
And much affection, too, from those
Whose dispositions predispose
Them to forgive you for a vice
Which I've referred to once or twice
In our long friendship. How irate
You've often made me, being late!
O Edward, you would be sublime
If only you could be on time.

—By W. B. HOWELL.

* Edward W. Archibald, Montreal, Docteur de l'Université de Paris *(Honoris Causa)*, 1937.

Association Notes

THE HISTORIC CHARM OF MONTREAL

The illustrations on these pages have been chosen with the idea of recalling to prospective attendants at our annual convention something of the historic associations of Montreal and the province of Quebec generally. It would be impossible to illustrate these fully in our *Journal*, just as it would be impossible for anyone attending the convention next June to visit more than a few places of interest. Our illustrations therefore are merely a reminder, and have been chosen at random.

Château de Ramezay

The Château de Ramezay concentrates in itself perhaps more of the city's history than any other one building, and, fortunately, its position in the oldest part of the city makes it a point from which other interesting places can easily be reached. The Château has been preserved intact, but at various times it has been nearly lost to us. It was built in 1705 by the French governor whose name it bears, and after the British conquest it was bought by the British Government in London to be the official residence of the governor of Montreal. It is full of records and pictures of famous personalities who have been in it, among them being that of Benjamin Franklin, who was one of the American commissioners sent in 1776 to try and gain French-Canadian support. After 1848 the Château was no longer used as the governor's residence; Montreal was having growing pains and governors were going out of fashion, at least by that name. This was rather a critical period for our Château. Everyone seems to have used it at some time or another: first the lawyers, who took it over as a court house; then the educators, who used it as an education office, whatever that may have been; then as a school; then as part of Laval University; then a court house again, and so on. However, at last it was taken over as city property and was converted into a museum. This is most excellently managed by the Antiquarian and Numismatic Society. The only trouble is that there is so much to see in it that anyone attending a medical convention is apt to find it a very potent counter-attraction. It probably is the only museum in the world with a tunnel running directly beneath it. That is the price antiquity has to pay for being allowed to remain in the heart of a very busy city.

Several imposing buildings stand close by, but none of them need any mention for the casual visitor excepting the Bonsecours Church. This is well worth visiting, and a climb into its tower will provide a view of the harbour not easily obtained otherwise. The spiral stairs are laden with votive offerings left by those who survived various perils of the deep, and the

whole atmosphere of the church, with its figure of the Virgin with arms outstretched over the harbour, is that of a sanctuary for those who go down to the sea in ships.

The Bonsecours Market, whose tides flow right up under the very windows of the church, is itself a fascinating scene of much that is typical in French-Canadian life. As a market, we are told, it is inadequate, but it is tenacious of its position and long may it retain it.

fences of Montreal against Indian attacks. Two towers stand in the grounds of the Grand Seminary of St. Sulpice on Sherbroke Street West. They were built by Abbé Vachon de Belmont, of the "Gentlemen of St. Sulpice", as the Sulpician Fathers are officially styled (hence the "Messieurs"), to protect from Iroquois attacks those who were drawn from friendly Indian tribes, and were being taught by the priests of the Sulpician Order and the

"Washing of the Feet"

The scene of the washing of the feet of the poor is another reminder of our city being the home of tradition, although of course this particular ceremony can only be witnessed on Maundy Thursday. On that day, at each of the great Roman Catholic churches here, St. Patrick's, Notre-Dame, etc., a group of twelve indigents from various institutions come and have their feet washed by one of the church dignitaries. Afterwards they receive a meal or some small alms. Of course, the custom is not peculiar to Montreal.

The "Fort des Messieurs" is one of the extremely few existing remnants of the old de-

devoted nuns of the period. The records tell us, just as does the diary of Jeanne Mance at the Hôtel-Dieu, of occasions on which teachers and students alike were driven into these forts for protection. One may read over the Seminary's doorway the inscription: "His evangelizabantur Indi, 1676".

Montreal can claim a long and interesting history. As a setting for our annual convention, we do not think it can be surpassed. The characteristics of the Province of Quebec itself also must not be forgotten, and travelling throughout the neighbouring country will reveal many attractions.

The Guest Speakers at the Annual Meeting

And now a few words concerning our guest speakers.

Professor E. P. Cathcart, Professor of Physiology at the University of Glasgow, will deliver an address to the annual meeting and will also speak in other centres in Canada next summer on Nutrition. Professor Cathcart is an international authority and a pioneer in investigations into problems of nutrition and metabolism.

Other guests will be Dr. A. J. Bedell, of Albany, N.Y., an ophthalmologist of national reputation, who has made outstanding contributions to the pathology of the retina; Dr. Clara M. Davis, of Winetka, Ill., an authority on the modern feeding of infants; and Dr. Norman Miller, formerly of the University of Iowa, and now Professor of Obstetrics and Gynæcology at the University of Michigan. Professor Miller is the author of numerous articles dealing with his chosen specialty, and he will speak at one of the sessions, in June, on the subject of Dysmenorrhœa.

Dr. K. A. MacKenzie, Professor of Medicine at Dalhousie University, Halifax, President of the Canadian Medical Association, will give one of the more important addresses in General Sessions in his capacity as Retiring President.

In the January *Journal* we announced the inauguration this year of round-table conferences, from 8.30 to 9.25 each morning of the forthcoming meeting. The Program Committee is completing arrangements for the conduct of these conferences, and the subjects of discussion and the names of the leaders appear in this and later issues of the *Journal*.

Fort des Messieurs

THE ANNUAL MEETING

Plans for the seventieth annual meeting to be held in Montreal on June 19, 20, 21, 22 and 23, 1939, are progressing very satisfactorily. At this juncture the Central Program Committee wishes to announce that papers will be presented by the following speakers:

Section of Anæsthesia

Dr. W. Easson Brown, Toronto
Studies with a newer anæsthetic.

Dr. Georges Cousineau, Montreal
Anæsthesia in orthopædic and thoracic surgery.

Dr. B. C. Leech, Regina
Cyclopropane as a complete anæsthetic agent.

Dr. C. C. Stewart, Montreal
Selection of anæsthesia for upper abdominal operations.

Dr. A. R. Wilkins, Toronto
Nupercaine spinal anæsthesia in abdominal surgery.

Section of Dermatology

Dr. D. E. H. Cleveland, Vancouver
The place of allergy in the diagnosis of skin conditions.

Dr. A. M. Davidson, Winnipeg
Fungus infections; selected aspects.

Dr. Lemuel P. Ereaux, Montreal
Peri-ocular dermatitis.

Dr. Albéric Marin, Montreal
Syphilis of the nervous system.

Dr. Harold Orr, Edmonton
The chemotherapy of acquired syphilis.

Dr. E. J. Trow, Toronto
The prevention of congenital syphilis.

Dermatology—*Continued.*

Dr. George S. Williamson, Ottawa
Atopic dermatitis in infants (infantile eczema), children and adults.

Dr. Norman Wrong, Toronto
The treatment of plantar warts.

Section of Historical Medicine

Dr. Maude Abbott, Montreal
Osler's pathological collection and his literary output (illustrated).

Dr. J. H. Couch, Toronto
Hippocrates' Hawley table.

Dr. T. G. H. Drake, Toronto
Antique medical caricatures.

Dr. J. H. Elliott, Toronto
An hour in Salerno.

Dr. Thomas Gibson, Kingston
The astonishing career of John Palmer Litchfield, first professor of forensic medicine at Queen's University, Kingston.

Dr. H. C. Jamieson, Edmonton
Alberta medicine in the eighties.

Dr. Ross Mitchell, Winnipeg
Dr. Cheedle in Western Canada, 1862-1863.

Dr. Leo Pariseau, Montreal
An exposure of Doctor (?) de Sales Laterrière, 1747-1815.

Dr. Eugène St. Jacques, Montreal
Our debt to Hippocrates (lantern slides).

Dr. E. P. Scarlett, Calgary
Oliver St. John Gogarty; the Celt as physician.

Section of Medicine

Dr. Edward Bartram, London
Healed dissecting aneurysm of the aorta.

Dr. Lennox Bell, Winnipeg
The diagnosis and treatment of refractory anæmias.

Dr. A. H. Gordon, Montreal
The physician's interest in gall-bladder disease.

Dr. J. H. Holbrook, Hamilton
Bronchoscopy in sanatoria; its use as an aid in diagnosis and treatment.

Dr. J. B. Jobin. Quebec
Goitre et hypertension arterielle; considérations à propos de 700 cases de goitre.

Dr. E. S. Mills, Montreal
Treatment of hæmorrhagic states.

Medicine—*Continued.*

Dr. John H. Palmer, Montreal
Uveo-parotid fever.

Dr. J. R. Pepin, Montreal
L'Obésité. Quelques conceptions étiologiques et modalités thérapeutiques.

Dr. I. M. Rabinowitch, Montreal
Dangers of protamin zinc insulin.

Dr. E. P. Scarlett, Calgary
Angina pectoris; a case study.

Dr. A. B. Walter, Saint John
The hypertensive heart.

Dr. Chas. H. A. Walton, Winnipeg
Pollen disease in Western Canada.

Section of Military Medicine

Major Hugh Cameron, Toronto
Investigations on the "blacking out" of pilots, R.A.F.

Lieutenant-Colonel R. M. Gorssline, D.S.O., Montreal
Mechanization in relation to medical services.

Major J. A. Linton, Ottawa, and
Lieutenant-Colonel Gordon Kenning, Victoria
The training of a medical officer.

Section of Obstetrics and Gynæcology

Dr. John S. L. Browne, Montreal
The significance of the endocrine assays in threatened and habitual abortion.

Dr. A. D. Campbell, Montreal
The clinical significance of sterility.

Dr. James Duncan, Montreal
The treatment of labour in the elderly primiparous woman.

Dr. George Hooper, Ottawa
The diagnosis and treatment of endometriosis.

Dr. P. J. Kearns, Montreal
The clinical significance of vulvar lesions.

Dr. John Mann, Toronto
The treatment of vertex occipito-posterior positions.

Dr. G. C. Melhado, Montreal
The management of delayed labour.

Dr. J. D. McQueen, Winnipeg
The value of a well-organized pre-natal clinic.

Dr. N. W. Philpott, Montreal
Breech presentation—a method of treatment with discussion of results.

Obstetrics and Gynæcology—*Continued.*

Dr. Alan Ross, Montreal
Skin affections of the new-born.

Dr. W. A. Scott, Toronto
Treatment of placenta prævia.

Dr. W. P. Tew, London
The induction of labour.

Section of Ophthalmology

Dr. François Badeaux, Montreal
Keratitis bullosa and keratitis vesicularis.

Dr. Howard Folger, Kingston
Squint.

Dr. J. P. Gilhooly, Ottawa
Moving pictures of muscle operations.

Dr. K. B. Johnston, Montreal
A clinical and pathological study of perforating corneal wounds.

Dr. H. M. Macrae, Toronto
Hemianopsia with spared macula.

Dr. R. J. P. McCulloch, Toronto
Eye signs in intracranial disease.

Dr. Alexander E. MacDonald, Toronto
Recent advances in the care of the insensitive cornea.

Dr. Hanford McKee, Montreal
The virus of inclusion conjunctivitis.

Dr. F. T. Tooke, Montreal, and
Dr. J. V. V. Nicholls, Montreal
Changes in fundus oculi in malignant hypertension following splanchnectomy.

Section of Otolaryngology

Dr. S. Laird Alexander, Toronto
The significance of lung collapse to the otolaryngologist.

Dr. David H. Ballon, Montreal
Foreign bodies in the air and food passages.

Dr. Godfrey Burr, Montreal
The testing of hearing aids.

Dr. F. A. Cays, Kingston
The diagnosis and treatment of malignant tumours of the pharynx.

Dr. Howard McCart, Toronto
Focal infection in the nose and throat.

Dr. W. P. E. Paterson, Ottawa
The treatment of nasal sinus infection by ultra short wave diathermy.

Dr. E. Fulton Risdon, Toronto
Tumours and cysts of the mouth and jaw and their treatment.

Otolaryngology—*Continued.*

Dr. H. W. Schwartz, Halifax
How to be wrong; the x-ray a quick and easy method.

Dr. D. E. S. Wishart, Toronto
Routine hearing tests.

Section of Pædiatrics

Dr. Gladys Boyd, Toronto
The treatment of juvenile diabetes.

Dr. Bruce Chown, Winnipeg
Abdominal tumours in children.

Dr. Clara Davis, Winnetka, Ill.
Observations on the results of self-selection of diets by infants.

Dr. R. R. Fitzgerald, Montreal
Recurrent abdominal pain in childhood.

Dr. Haddow M. Keith and
Dr. J. N. Petersen, Montreal
Newer drugs in the treatment of epilepsy.

Dr. Harold Little, London
The significance of melæna.

Dr. Alan Ross, Montreal
Etiology and treatment of nephritis in childhood.

Dr. Graham Ross, and
Dr. W. E. Williams, Montreal
Vitamin D intoxication in infancy.

Dr. King Rowan-Legge, Ottawa
Some aspects of the neo-natal death problem.

Dr. Jessie Boyd Scriver, Montreal
The use of the sedimentation rate in pædiatric practice.

Dr. Nelles Silverthorne, Toronto
Immunization in whooping cough.

Section of Radiology

Dr. E. C. Brooks, Montreal
Lymphosarcoma of the stomach.

Dr. W. W. Bryan, Montreal
Syphilis of the stomach.

Dr. E. M. Crawford, Pointe Claire, Que.
Hypertrophy of the pyloric muscle in the adult.

Dr. J. E. Gendreau, and
Dr. Origène Dufresne, Montreal
The value of hysterosalpingography in gynæcological diagnosis.

Dr. Jules Gosselin, Quebec
Seriescopy (illustrated).

Dr. W. A. Jones, and
Mr. G. Hayunga, Ph.G., Kingston
The findings in an x-ray film of the chest of an electric arc welder.

Radiology—*Continued.*

Dr. J. W. McKay, and
Dr. J. Pritchard, Montreal
Roentgenological and pathological studies of bullous emphysema.

Dr. Carleton B. Peirce, Montreal
The development of a tumour conference in a General Hospital.

Dr. A. C. Singleton, and
Dr. Joseph Sommers, Toronto
Cancer of the stomach.

Section of Rheumatic Diseases

Dr. W. S. Barnhart, Ottawa
Some observations on vaccine treatment of arthritis.

Dr. J. A. Nutter, Montreal
Orthopædic treatment of arthritis.

Dr. R. R. Struthers, Montreal
Rheumatic fever in childhood.

Section of Surgery

Dr. E. H. Botterell, Toronto
Spinal cord complications in broken backs.

Dr. J. T. Danis, Toronto
The pathology and treatment of ischio-rectal abscess and fistula in ano.

Dr. Edmund Dubé, Montreal
End results of chronic osteomyelitis after ten years (Review of cases).

Dr. A. W. Farmer, Toronto
The treatment of contracture due to burns.

Dr. Mercier Fauteux, Montreal
A contribution to the study of the surgical treatment of angina pectoris (illustrated by film).

Dr. Alexander Gibson, Winnipeg
Ambulatory treatment of fractures.

Dr. A. J. Grace, London
Acute intestinal obstruction.

Dr. C. K. P. Henry, Montreal
Extra-hepatic biliary growths including malignancy neoplasms.

Dr. R. A. Johnston, London
Burns—treatment based on pathological physiology.

Dr. V. O. Mader, Halifax
A new surgical approach to the knee joint.

Dr. Gavin Miller, Montreal
The reasons for subtotal resection in cases of gastric and duodenal ulcer.

Surgery—*Continued.*

Dr. Albert Ross, and
Dr. Charles Letourneau, Montreal
Series of perforated peptic ulcer.

Dr. A. L. Wilkie, Montreal
Bile-salt therapy in common-duct drainage.

Section of Urology

Dr. N. E. Berry, Kingston
Some observations and results of conservative renal surgery

Dr. J. Victor Berry, Ottawa
Urological conditions in children.

Dr. W. A. Dakin, Regina
Unilateral multilocular cystic kidney with report of a case in a young child.

Dr. Gordon S. Foulds, and
Dr. E. H. Shannon, Toronto
The relative merits of intravenous and retrograde urograms.

Dr. Oscar Mercier, Montreal
Surgical treatment of the traumatic strictures of the urethra.

Dr. H. D. Morse, Winnipeg
Renal tuberculosis.

Dr. Robin Pearse, Toronto
The treatment of infiltrating tumours of the bladder with special reference to cystectomy.

Dr. Max Ratner, Montreal
Metastases in malignancy of the genito-urinary organs.

Dr. M. I. Seng, Montreal
Present status of tumours of the bladder.

General Sessions

Dr. J. D. Adamson, Winnipeg
Pulmonary emphysema.

Dr. A. J. Bedell, Albany, N.Y.
Retinal changes in arterial hypertension.

Dr. E. P. Cathcart, Glasgow, Scotland
Nutritional subject.

Dr. F. E. Cormia, Montreal
Syphilis as a Canadian problem.

Dr. H. B. Cushing, Montreal.
Infant feeding during the past three decades.

Dr. W. E. Gallie, Toronto
The use of the Smith-Peterson Pin in fractures of the neck of the femur.

Dr. F. B. Gurd, Montreal
Gall-bladder surgery.

General Sessions—*Continued.*

Dr. J. C. Meakins, Montreal
A review of the present status of hypertension.

Dr. E. C. Menzies, Saint John
Insulin therapy and hypoglycæmia for cases of schizophrenia.

Dr. Norman Miller, Ann Arbor, Mich.
The treatment of dysmenorrhœa.

Dr. K. A. MacKenzie, Halifax
Valedictory Address.

Dr. Wilder Penfield, Montreal
Epilepsy.

Dr. G. E. Richards, Toronto
A conception of adequate radiation in the treatment of malignant diseases.

Dr. James Ross, Montreal
Review of specific therapy in pneumonia.

ROUND TABLE CONFERENCES

An interesting innovation this year will be the Round Table and Instructional Conferences which will take place from 8.30 to 9.25 on the mornings of Wednesday, Thursday and Friday, in the following Sections:

Section of Anæsthesia

Subject—The choice of anæsthetic

Dr. Wesley Bourne, Montreal
Dr. J. A. Blezard, London
Dr. M. M. Clermont, Montreal
Dr. H. R. Hargrave, Toronto
Dr. Kenneth M. Heard, Toronto
Dr. K. E. Hollis, Toronto
Dr. P. E. O'Shaughnessey, Montreal
Dr. H. J. Shields, Toronto
Dr. Don A. Warren, Hamilton
Dr. E. H. Watts, Edmonton
Dr. F. A. H. Wilkinson, Montreal

Section of Dermatology

Subject—The treatment of eczematous reactions

Dr. J. F. Burgess, Montreal
Dr. D. S. Mitchell, Montreal
Dr. B. D. Usher, Montreal

Section of Medicine

Anæmia
Dr. Jos. Kaufmann, Montreal

Diuretics
Dr. Sclater Lewis, Montreal

Pneumonia
Dr. A. H. Gordon, Montreal

Section of Obstetrics and Gynæcology

Subject—Puerperal infection

Dr. H. C. Burgess, Montreal
Dr. E. Couture, Ottawa
Dr. J. R. Goodall, Montreal

Subject—Toxæmia of pregnancy

Dr. R. B. Meiklejohn, Toronto
Dr. Ross Mitchell, Winnipeg
Dr. W. A. Scott, Toronto
Dr. H. B. VanWyck, Toronto

Subject—Hæmorrhage at the menopause

Dr. W. A. G. Bauld, Montreal
Dr. J. E. Gendreau, Montreal
Dr. Léon Gérin-Lajoie, Montreal
Dr. J. Stewart Henry, Montreal
Dr. Melville Watson, Toronto

Section of Ophthalmology

Subject—Glaucoma, diagnosis and treatment

Section of Otolaryngology

Dr. Arthur Childe, Montreal
X-ray examination of the mastoids and sinuses.

Dr. J. K. M. Dickie, Ottawa
The management of acute infections of the ear.

Dr. John Gerrie, Montreal
Lesions of the mouth of interest to the physician.

Dr. Perry G. Goldsmith, Toronto
The diagnosis and present treatment of sinus disease.

Dr. A. T. Henderson, Montreal
Allergy in relation to the ear, nose and throat.

Dr. Gregor McGregor, Toronto
Pathology of the ear.
Pathology of the nose and throat.

Dr. Francis L. McNaughton, Montreal
Headaches and neuralgia of the face.

Dr. J. T. Rogers, Montreal
The conservative and radical treatment of chronic otorrhœa.

Dr. J. A. Sullivan, Toronto
Special technique in mastoid and facial nerve surgery.

Dr. D. E. S. Wishart, Toronto
The diagnosis and surgical treatment of suppurative petrositis.

Section of Pædiatrics

Subject—X-ray lesions of the bones in infancy

Dr. A. E. Childe, Montreal

Dr. L. M. Lindsay, Montreal

Dr. Howard Mitchell, Montreal

Subject—Convulsions in infancy and childhood

Dr. S. Graham Ross, Montreal

Subject—Tuberculosis in childhood.

Dr. P. N. MacDermot, Montreal

Dr. H. P. Wright, Montreal

Section of Radiology

Subject—Spot-film radiography

Dr. A. McNabb, Ottawa

Dr. W. L. Ritchie, Montreal

Dr. A. C. Singleton, Toronto

Subject—The radiological treatment of cancer

Dr. J. E. Gendreau, Montreal

Section of Surgery

Subject—Oblique and direct inguinal hernia; choice of the radical operation

Dr. George E. Wilson, Toronto

Subject—Appendicitis; delayed versus immediate operation in early peritonitis

Dr. E. W. Archibald, Montreal

Section of Urology

Subject—Prostatectomy

Dr. D. W. MacKenzie, Montreal

Dr. H. D. Morse, Winnipeg

Subject—Urinary antiseptics with particular reference to mandelic acid and sulphanilamide therapy.

Dr. D. R. Mitchell, Toronto

Hospital Service Department Notes

Schools for Interns

A novel suggestion, and one with considerable merit, was advanced by Dr. E. Stanley Ryerson, Assistant Dean, Faculty of Medicine, University of Toronto, at the recent convention of the Ontario Hospital Association. It was proposed that hospitals employing interns establish Schools for Interns, and that such be under the direction of a full-time or part-time medical director.

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

In supporting his proposal, Dr. Ryerson points out that internships and residencies have assumed much more importance during the past generation. Now almost all medical students take internships of varying lengths and types. The hospitals providing the internships are now "approved", or otherwise, in Canada by the Canadian Medical Association and in the United States by the American Medical Association. The difficulty is that of maintaining adequate supervision over the intern's work and instruction. In some instances the medical schools have assumed the responsibility, and it has been suggested that the provincial licensing bodies assume this rôle. The difficulty in both instances is that supervision is, or would be, limited to the first year of internship.

Many hospitals now have intern committees. These committees are quite satisfactory for making the appointments of interns, but as they are usually made up of staff men giving their services gratuitously they do not always function as effectively as they should. At the present time oversight of the interns is usually left to one or more of several individuals or groups, the superintendent of the hospital, the assistant superintendent, the intern committee, the heads of services, or the senior resident. This division of authority is not conducive to efficient functioning of the intern body. The establishment of a school for intern and resident training with a director in charge is advocated. The conduct of such a school for interns would follow along the same general lines as the school for nurses. The director of intern training would be a medical man, who would be on a salary from the hospital. Whether such a doctor would devote his whole time to intern administration, or whether he would function on a part-time basis, would depend on the size and character of the hospital and the number of interns and residents who could be effectively trained. In the smaller hospital he would probably be a part-time member of the active staff.

The functions of the school for interns and of its director of intern training would be: (1) To supervise the practical training of the interns and residents, one individual assuming the responsibility now vested in the intern committee, the administrator, the chiefs of services and others; (2) to determine the extent to which formal instruction and education would be provided; (3) to supervise the health of the interns and residents; (4) to work out a plan for the appointment of interns with the deans of the different medical schools; (5) to maintain records respecting the interns and their work.

It is suggested that large hospitals with 25 or more interns should have a director on practically a full-time basis. Medium-sized hospitals with from 8 to 25 interns might manage with a part-time director who would also function as

the assistant superintendent; in smaller hospitals a junior member of the medical staff might be appointed on an honorarium basis of remuneration.

It is proposed that the director in each hospital submit reports on the interns to the Department of Hospital Service of the Canadian Medical Association. These records of interns and residents would be of considerable value for medical schools, licensing bodies, health departments, and others. The same principle which now governs the relationship of the hospital administration and management to the school for nurses would be applicable to such a school for interns.

The Cancer Campaign

The Canadian Society for Control of Cancer

February first will no doubt long be a memorable day for the Canadian Society for the Control of Cancer. On that day a communication was received from the Privy Purse Office, Buckingham Palace, containing the information that His Majesty The King had been graciously pleased to grant his Patronage to the Society. In the evening the first public meeting under the auspices of the Ontario Branch was held in Ottawa. His Excellency, The Governor-General, Lord Tweedsmuir, G.C.M.G., C.H., graciously attended and delivered an inspiring address. Dr. William Boyd, Professor of Pathology, University of Toronto, was the scientific speaker for the evening. Dr. Boyd lived up to his reputation as one of Canada's best medical speakers. Mr. H. Napier Moore, a director of the Society and chairman of the publicity committee, made an eloquent plea for membership and public support. Dr. R. E. Valin spoke in French. Through the kindness of the CBC the speeches were broadcast across Canada. Dr. Warren Lyman, of Ottawa, acted as chairman and present on the platform in addition to the speakers were Sir Lyman Duff, chairman of the Board of Trustees of the King George V Silver Jubilee Cancer Fund, Rev. Dr. Woodside, Msgr. Charbonneau, Hon. Dr. Manion, General McNaughton, Col. Clarke, Drs. R. E. Wodehouse, J. J. Heagerty, A. T. Bazin, T. C. Leggett, H. Lapointe, P. Brodeur, T. C. Routley, A. D. Kelly, G. J. Wherrett, and C. C. Ross. Almost a thousand people were present and they listened to the speakers with rapt attention. From reports there were in addition many thousands who tuned in to listen to the radio broadcast. The local committee in Ottawa are to be congratulated upon the outstanding success of this meeting. In the near future similar public meetings will be held in London, Kingston, Windsor and other cities.

Dr. T. C. Routley, who has recently returned from a trip to the west coast, reports great enthusiasm for the work of the Society in the western provinces. He kindly delivered several public addresses at the request of the provincial branches. Dr. J. S. McEachern spoke before the Calgary Rotary Club in January.

The first issue of the Society's bulletin *Cancer* was published in January, ten thousand copies being distributed throughout Canada. As a result of these bulletins many applications for membership have been received. This is a lay medical organization and all doctors are invited to become members by applying to the National Headquarters, 43 St. George Street, Toronto. By urging their patients also to apply for information and membership the medical profession can do a great deal to further the work of the Society.

Material for publication in the bulletin *Cancer* should be forwarded to the Canadian Society for the Control of Cancer, 43 St. George Street, Toronto.

The Early Diagnosis of Cancer

The improved outlook in cancer is due in part to better technique in treatment, but in part also to better and earlier diagnosis. The importance of early diagnosis is indeed so overwhelming that much effort has been made and a good deal of money spent in trying to educate the public on this subject. How much effort such propaganda can have is uncertain, and both the spoken and the written word can cause unnecessary apprehension besides perhaps doing good. Periodic medical examination in middle and later life is undoubtedly desirable, but how frequent it should be and to what lengths it should go are other questions on which there is no general agreement. But whatever doubt there may be about the education of the public in this matter there is none about the imperative need for a fully educated medical profession. A patient attentive to the possible first signs of cancer can have his vigilance rewarded only by a doctor with the knowledge and diagnostic ability to interpret them. These qualities, and the acumen, also based on knowledge, which will descry in the trivial symptom a danger signal calling for further investigation, are capable of higher development in most of us. No one has ever pretended to estimate how often the blame for delayed diagnosis rests on the patient and how often on his doctor, but were such an analysis possible the medical profession would not be entirely exculpated. If it be granted that education of the profession is at least as much to be desired as that of the public, an important service has been rendered by the Canadian Medical Association in publishing a *Handbook*

on Cancer intended for the general practitioner.* This book of 232 pages is simple and unencumbered by illustrations or masses of figures, but it has been written by experts and furnishes an admirable account of the pathology, symptomatology, diagnosis, and treatment of cancer in every part of the body. The information given is authoritative, up-to-date, and surprisingly full and detailed for chapters so brief and easily read; that on bone tumours, for example, clearly describes and distinguishes between the four types of primary growth in bone, and the very different course taken by each of them. In describing symptomatology, emphasis is laid on the first presenting symptom, and a graphic picture given of the features by which the disease should first be recognized or suspected. Methods of examination, both simple and special, are adequately described; there is, for example, an excellent account of the use of inspection and palpation in detecting a carcinoma of the breast, while various endoscopic methods and procedures for securing a histological diagnosis are assigned their place and value. The rules given for treatment are precise and well informed, and the prognosis is stated in terms as exact as a few well-chosen figures can make them; when treatment by irradiation has been shown to be fruitless this is plainly stated. The possibility of prophylaxis is not forgotten, predisposing causes being mentioned where they are known to exist, and precancerous conditions described. The chapters on cancer of different organs follow accounts of the general principles of treatment and those underlying radiological treatment and an introductory chapter on the general pathology of the disease which furnishes an admirable summary of the present position of cancer research. Almost everyone has something to learn from a book such as this, and to many without special experience and training it can be a most valuable guide. Some of the funds available for promoting the study and improving the treatment of cancer could scarcely be better spent than in sending a copy of this book to every practitioner in the country. The *Canadian Medical Association Journal* in announcing its publication says that free copies have been presented to members of the C.M.A. as a contribution to the nation-wide campaign against cancer. Applications from other members of the profession should be addressed to the General Secretary, Canadian Medical Association, 184, College Street, Toronto.—From *Brit. M. J.*, 1938, **2:** 1374.

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Medical Societies

The Canadian Rheumatic Disease Association

This Association held its second annual meeting, in Halifax, in June, 1938, as a Section of the Canadian Medical Association. The following officers were elected. *Honorary President*, Dr. J. C. Meakins, Montreal; *President*, Dr. Douglas Taylor, Montreal; *First Vice-president*, Dr. Duncan Croll, Saskatoon; *Second Vice-president;* Dr. J. W. Merritt, Halifax; *Secretary*, Dr. W. S. Barnhart, Ottawa; *Treasurer*, Dr. J. F. Argue, Ottawa.

At a Council meeting, held in Ottawa, October, 1938, the aims and policies of the association were reviewed, some of which may be sum-

marized as follows: (1) To organize a campaign against rheumatic diseases in Canada. (2) To encourage among the members of the profession coordinated research and the study of the rheumatic diseases, along with a sane program of therapy. (3) To educate the lay public in matters pertaining to rheumatic diseases so that eventually they may assist in this campaign.

It was decided to extend the preliminary work of surveying the rheumatic disease situation in Canada. Accordingly an attempt will be made to ascertain (1) the facilities at present available for the study and treatment of arthritic and rheumatic patients in the larger hospitals, and (2) the amount and type of teaching done in the medical schools on the subject of chronic arthritis and rheumatic fever.

The need for further and complete organization to continue this work properly was emphasized. The hope was expressed that all of the provinces would organize their local units in such a manner that the work of the Association would progress favourably. All interested members of the profession are cordially invited to participate in this project.

An attractive program is being arranged for the third annual meeting, with the Canadian Medical Association in Montreal, June, 1939.

Canadian Rheumatic Disease Association, Montreal (Que.) Division

An organization meeting of the Montreal group was held at the Children's Memorial Hospital last October. The following officers were elected. *Chairman,* Dr. R. R. Struthers; *Co-chairman,* Dr. Albert DeGuise; *Secretary,* Dr. L. J. Adams; *Treasurer,* Dr. J. Palmer.

In November, at a special meeting of the Association the guest speaker was Dr. Chester S. Keefer, Associate Professor of Medicine, Harvard University. The topic of an extremely interesting and instructive discourse was "The pathogenesis of gonococcal arthritis and the more recent methods of treatment".

The next meeting of the Association will be held early in the spring. The meetings, as well as membership in the organization, are open to all members of the profession.

The Lunenburg-Queens Medical Society

This Society held its annual meeting at a banquet in Bridgewater, N.S., on December 6th. The following officers were elected: *President,* Dr. C. A. Donkin, Bridgewater; *Vice-president,* Dr. W. A. Hewat, Lunenburg; *Secretary-treasurer,* Dr. C. G. MacKinnon, Bridgewater; *Executive,* Drs. Hugh Fraser, Bridgewater, and J. C. Wickwire, Liverpool. Representatives to the Medical Society of Nova Scotia: Dr. G. A. Barss, Rose Bay, Dr. C. B. Cameron, Petite Riviere.

Dr. C. E. Kinley, of Halifax, spoke on "Tumours of the breast," and Dr. C. W. Holland, of Halifax, on "The use of protamine-zinc insulin".

The New Brunswick Medical Society

The New Brunswick Medical Society has tentatively set the dates of August 29th and 30th for their annual meeting which will be held this year at the Algonquin Hotel, St. Andrews.

The Saint John Medical Society

The Saint John Medical Society held its monthly meeting on February 1st at the Admiral Beatty Hotel. Dr. G. B. Peat, senior Obstetrician at the General Hospital, presented an analysis of the obstetrical services at the General Hospital since its inception in 1932. He tabulated and analyzed the cases handled in the wards and outdoor clinics in groups of a thousand. From the time when this clinic was established there has been no maternal death in any case which has had prenatal care. The infection rate was extremely low, and Dr. Peat stressed the advantage of close cooperation between the prenatal clinic and the indoor services, complimenting both the profession and nursing staffs of these two branches of service. Discussion of this paper was led by Drs. Joseph Tanzman and George White. A suggestion made in the discussion was to the effect that more frequent Cæsarean sections would perhaps be advisable. Dr. Peat answered this suggestion by stating that careful, repeated examinations of cases with small pelves and induction of labour at a proper period in the pregnancy had obviated the necessity for more frequent sections. A. S. KIRKLAND

University Notes

The University of Toronto

The President of the University has announced that the Board of Governors will accept with pleasure and gratitude a gift of $250,000 provided by the Rockefeller Foundation toward the endowment of the School of Nursing at the University. The School was established in the University in 1933 to carry on the work maintained in a smaller teaching department set up in 1920 through the Ontario Branch of the Canadian Red Cross. Since the work was begun in 1920, Public Health Nurses trained in this department have gone to all parts of this province, throughout the whole Dominion, and to many countries where public health nursing has been in a rudimentary condition. This grant creates a feeling of security for the future of this school. In its present

enrolment of 119 there are nurses from Portugal, New Zealand, South America, as well as from all parts of Canada. Since its inception it has graduated 829 nurses who are to be found at work in Britain, in ten or twelve of the countries of Europe, as well as throughout North and South America.

The Department of Medical Research of the University of Toronto at the Banting Institute have received from the Supreme Council of the Scottish Rite Masons $2,500 to carry on research work on the insulin and metrazol treatments for dementia præcox.

The gift of 200 mg. of radium has been made to the Department of Medical Research by Gilbert A. Labine of the Eldorado Mines as a memorial to his son, Leonard, which has been presented with the wish that it be used for the furtherance of scientific knowledge in whatever manner may seem advisable to the Department.

J. H. ELLIOTT

Letters, Notes and Queries

The "New" Menstruation Toilet

In view of the fact that the use of tampons during menstruation has become increasingly wide-spread during the past few years it seems desirable to acquaint our readers with all sides of the question, for it is evident that there is some difference of opinion among medical practitioners as to the propriety of such appliances. In our issue of January, 1939, page 7, we had a reference to this matter in the form of a "filler". This was published merely as a matter of news, not necessarily as a matter of fact, and represented merely one individual's opinion, which in this instance was adverse. We now publish "the other side". We reprint, therefore, a letter from Dr. Edward Elkan. It seems clear that the tampon being used for the menstrual toilet has come to stay, and we may be better employed in advocating its intelligent use rather than in condemning it *in toto*. [EDITOR]

Sir,—The "new" menstruation toilet is not so new. Apart from the fact that ballet dancers have used cotton-wool plugs at all times, I can vouch for the bacteriological integrity of more than one of my patients who has used some or other of the incriminated methods for over four years. A novice in this field, after reading Dr. Moss's letter (*Brit. M. J.*, 1938, **2**: 1113), might conclude that women are in the habit of plugging the vagina when the necessity arises, and of leaving these plugs *in situ* until they become "offensive and infected", while at the same time deadly bacteria are given a chance to breed in the "dammed-up blood" above the plug. In fact nothing of the kind ever takes place, nor does it seem that even Dr. Moss has ever seen a case of "vaginitis, cervicitis, *B. coli* infection . . . or sterility" caused by this method. He only asserts that these conditions are "likely to result" from the new menstruation toilet.

On the contrary, they are not at all likely to occur, because all women who use any of these methods know that they must change their sponges or cotton-wool plugs every three hours, or before the full capacity of their soaking power is reached. They know that they must change them in time because menstrual blood does not, as a rule, coagulate, and will therefore not be "dammed up" above the plug. The incubator situation Dr. Moss describes in such gloomy terms in fact does not arise, and while I have seen some of my patients discontinue the use of this method because they disliked the presence of a foreign body in the vagina, I have never seen a case, nor heard of one, in which this method has been the cause of any inflammatory or bacteriological trouble. And if any further proof of the harmlessness of this method be needed it might be found in the fact that it is recommended particularly by woman doctors who have found it beneficial and harmless in their own experience. —I am, etc.

EDWARD ELKAN.

London, W.1, December 1st.

(From *Brit. M. J.*, 1938, **2**: 1229.)

Answers to letters appearing in this column should be sent to the Editor, 3640 University Street, Montreal.

A Trial Study of 1,800 Cases of Syphilis Infected Twenty Years Ago

To the Editor:

I wish to comment on the recent statistical report of F. S. Burke and Margaret Parkes, concerning a trial study of 1,800 cases of syphilis, infected 20 years ago. (This *Journal*, 1938, **39**: 145. [ED.])

In reading over this report I was struck by its purely statistical nature, and, although the authors must be congratulated for their accurate summary of the facts at hand, the statistical analysis of the course of the disease in this group of patients is not in accordance with that generally accepted by syphilologists, and in many points is at complete variance with previously compounded studies.

In attempting to make an analysis of this nature certain prerequisites are essential. These are as follows: First, the diagnosis of the initial lesion and the time of onset of the infection must be accurate. Secondly, the patients must be followed through and directly contacted at the time of the survey. Thirdly, this personal follow-up must include a history, a complete physical examination, adequate examination of the cardiovascular system, including fluoroscopy, and an examination of the spinal fluid. Fourthly, dead patients, unless the cause of death can absolutely be certified as being due to syphilis, and the type of involvement be known, must be excluded from the study.

As will be seen by a further analysis of the material, none of these prerequisites has been fulfilled. It is well known that in a large part of the war material, due to the pressure of time, limited personnel, and poor facilities, all patients with penile lesions were diagnosed as syphilis and treated as such. I do not say that this is the case in the present series, but there is no statement as to how the diagnosis of primary syphilis was made. If all cases presenting penile

lesions were so diagnosed the initial error would approximate 40 per cent, since that was the relative proportion of chancre and chancroid during the war. If these cases were not diagnosed by dark field, Wassermann test, or both, it can be seen that the percentage of negative Wassermann reactions at the end of a single course of treatment would be greatly changed.

Under social history, the authors assume that, since 75 per cent of the cases have post-war files, if a physical, mental, or economic break-down had taken place there would, in all likelihood, be a record in the man's docket. This, to my mind, does not necessarily follow. Many cases of cardiovascular syphilis, for example, are diagnosed otherwise, and the presenting symptoms not infrequently assumed to have no relation to the long-standing syphilitic infection. They then state that the number of patients mentally incapacitated is surprisingly few. This would naturally be expected, since most symptomatic nervous system syphilis appears in the first 20 years of the disease, and some of these patients would have died, undiagnosed. A small residue of patients would still be asymptomatic, *i.e.*, diagnosable only by spinal fluid examination.

The number of patients with sequelæ, 6.3 per cent is definitely smaller than that recorded in a comparable series.[1]

It is to be noted that the large majority of these patients received but one course of treatment. This course of treatment, according to the authors, consisted of approximately 7 injections of an arsenical compound, and 7, or more, of mercury. Yet, the authors report only 6.3 per cent sequelæ. The early material by Stokes and his co-workers,[2] for example, constituting nearly 3,000 patients, showed that prolonged, continuous treatment, consisting of more than 20 injections of an arsenical and a comparable amount of heavy metal, was more than twice as effective as continuous treatment consisting of less than 20 injections, carried out for a year or less. The result is even more pronounced when one compares the results with that obtained by using a treatment total of 7 arsenical injections. According to a later report of Stokes and the cooperative clinical group[3] the short arsphenamine course is definitely conducive to a lowering of the patient's own immunological balance, thus engendering all sorts of relapsing lesions, from the chancre to obvious neurosyphilis.

It will be noted that only 7 cases of cardiovascular syphilis were found in these 1,800 cases. The cooperative clinical group found that in a comparable series of cases, cardiovascular and neurosyphilis, in a distinctly higher percentage, were found almost exclusively in patients so inadequately treated.[4] In the present series, it may be that the insignificant number of patients reported is due to the lack of personal follow-up, of physical and x-ray examination, and the exclusion of patients who had died, cause unknown. In addition, cross-checking of patients with symptomatic neurosyphilis would reveal an incidence of from 20 to 50 per cent of cardiovascular involvement. These same criticisms, in addition to the failure to perform a lumbar puncture on all reported cases, may account for the very low incidence of neurosyphilis, 3.3 per cent. In the report by O'Leary, and his coworkers[5] the lowest incidence of asymptomatic neurosyphilis in patients with early syphilis, who had received at least 20 injections of arsenic and of heavy metal, was 7.5 per cent. These same authors found that, of the patients with early syphilis who had received less than this amount of treatment, the incidence was 22.6 per cent. Going one step further in the analysis of this same group of patients, in at least 40 per cent the changes in the spinal fluid were marked, and the majority of this group would undoubtedly have developed severe clinical neurosyphilis if untreated. Therefore, going back to the authors' report of 3.3 per cent of neurosyphilis, and comparing it to O'Leary's group of patients, it will be seen that the incidence of nervous complications for this comparable group should be considerably higher.

While I believe that the authors have accurately reported the statistical data at their disposal, the shortcomings of such data are obvious, and no conclusions, or even impressions, can be drawn until each patient has been personally followed and a thorough check-up has been completed. I do not believe, therefore, that their statement that the white male is probably developing a certain amount of resistance to syphilis, is correct. All the recent evidence, on the contrary, is that with the growing complexity of civilization the incidence of neurosyphilis, with particular regard to paresis, in untreated patients, is distinctly on the increase. Similarly, the incidence of cardiovascular syphilis may depend, in large part, upon the strenuousness of the occupation of the syphilitic patient, and there is no evidence in the literature that this complication is decreasing, except as a result of prolonged treatment of early syphilis.[6] While the statistical data are certainly of considerable interest, the conclusion which any practitioner will inevitably draw, namely that 6 or 7 injections of an arsenical will prevent the late complications of syphilis, is dangerous and incorrect.

FRANK E. CORMIA, M.D.
Montreal.

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Abstracts from Current Literature

Medicine

Course of Polycythæmia. Rosenthal, N. and Bassen, F. A.: *Arch. Int. Med.*, 1938, **62**: 903.

Primary polycythæmia is a disease of long duration. It may be asymptomatic in the early stage. After a period of years a variety of clinical conditions apparently develops, as a result of either hyperactivity of the leukopoietic or megakaryocytic systems or of exhaustion of the erythropoietic system. In its terminal stages this disease may become leukæmic, thrombocythæmic or anæmic, or may reveal various remarkable combinations of any or all of these phases.

The authors select 13 cases from a group of 75, illustrating variations of the clinical course. (1) Asymptomatic phase; 2 cases are described when the diagnosis was made accidentally, in one case by bleeding from the gums, and the second by finding albuminuria during a life-insurance examination. (2) Polycythæmic phase; symptomatic; this is the stage best known to the clinician. (3) Polycythæmia associated with thrombocythæmia. In this group the blood platelets are unusually numerous and thrombosis is prone to develop. The authors cite a case in which the platelets numbered 1,500,000 per c.mm., and thrombosis of a mesenteric vein developed with intestinal bleeding, necessitating blood transfusion. (4) Polycythæmia associated with increased leukoblastic activity and megakaryocytic activity. Cases are reported in which the myeloid elements are increased out of proportion to the erythrocytes. One patient showed a leucocytosis of 189,000, which he classes as erythroleukæmia. The prognosis is not good in these patients. (5) Anæmic phase: this stage is a late development, providing the disease is not terminated early in its course by a vascular complication. All the elements may be depressed, so that in addition to the anæmia there are leukopenia and thrombopenia. LEYLAND J. ADAMS

Macrocytic hæmolytic Anæmia Associated with Increased Red Cell Fragility. Dyke, S. C. and Young, F.: *The Lancet*, 1938, **2**: 817.

Dyke and Young discuss the common features in 6 cases of anæmia of the macrocytic type. These features are (1) anæmia with hæmolysis, shown by bilirubinæmia and increased van den Bergh reaction, (2) increased fragility of the erythrocytes, (3) increase in the mean diameter of the red cell and a high colour-index, (4) a protracted course with remission and relapse, (5) abnormal activity of the hæmatopoietic system, and (6) moderate splenic enlargement with endothelial proliferation and phagocytosis of the red blood cells. This macrocytic hæmolytic anæmia was unresponsive to liver extract and has been identified with congenital acholuric jaundice of the Chauffard type. Actually, the only outstanding resemblance between them is fragility of the erythrocytes. Their points of dissimilarity are much more numerous. The response to splenectomy of these two types of hæmolytic anæmia points strongly to the conclusion that they bear no relation to each other. In congenital acholuric jaundice splenectomy has been recognized and the operation, with reasonable certainty, does bring about disappearance of the symptoms. The author's results of his reported series makes the value of splenectomy appear doubtful in this acquired type under discussion and its justification very debatable.

S. R. TOWNSEND

Paroxysmal and Persistent Hypertension in Association with Lesions of the Adrenal Glands. Nuzum, F. R. and Dalton, J. W.: *Am. Heart J.*, 1938, **16**: 643.

This paper summarizes the cases in the literature in which the relationship of the adrenal glands to hypertension has been proved by post-mortem examination or by surgical intervention and reports two new cases. The first case differs from other reported cases in that marked hyperplasia of the adrenal cortex and a cortical adenoma were apparently responsible for the development of hypertension in spite of the presence of definite cardiac decompensation. In the second there were symptoms simulating angina pectoris but a diagnosis of pheochromocytoma was later made and confirmed by operation. There are found 85 instances of pheochromocytoma reported in the literature. A clinical diagnosis was made in only 20 cases. It appears that a considerable number of these tumours are masquerading under a variety of symptoms and so escape detection. It is stated that a clear-cut diagnosis can be made through roentgenological studies preceded by the injection of air about the adrenal glands.

W. H. HATFIELD

Surgery

Protruded Intervertebral Discs. Love, J. G. and Walsh, M. N.: *J. Am. M. Ass.*, 1938, **111**: 396.

"It may safely be said that, today, protrusion of intervertebral discs constitutes one of the major causes of sciatic pain. Indeed, it is quite as antiquated to make a diagnosis of 'sciatica' today as it is to make a diagnosis of 'headache'." That is one of the conclusions arising from this study of 100 cases, in which it was shown that painful symptoms were caused by the pressure

of intervertebral discs protruding into the spinal canal. The condition has been known for many years and it is readily diagnosed by modern methods. In the series mentioned 88 of the cases occurred in the lumbar region, the remainder at various levels from the 5th cervical downwards. This distribution supports the prevailing idea that in most cases trauma is the exciting cause of protrusion.

The duration of symptoms averaged four years. Intermittent symptoms were commonest in the lumbar cases; frequently the patient felt quite well between recurrences. This is difficult to explain, except by assuming that the cartilage slips back from the canal and is extruded again by fresh trauma. Possibly some of the dramatic results of manipulation of the spine by irregular practitioners are due to this slipping back.

The diagnosis is based on the symptoms (sciatic pain occurred in 92 per cent of the lumbar cases), a diminished or lost Achilles reflex, and an increased total protein content of the cerebrospinal fluid, but this last is not infallible. Confirmation is made by subarachnoid injection of iodized oil, with fluoroscopy.

Surgical removal of the protruding part of the offending disc or discs is advised, by means of laminectomy. No fixation is required afterwards. The results have been excellent and no recurrences have been reported.

H. E. MACDERMOT

Rupture of the Nucleus Pulposus. Batts, M., Jr.: *J. Bone & Joint Surg.*, 1939, **21**: 121.

The recent more frequent diagnosis of this condition prompted the dissection of 50 cadavers upon whom no clinical data were available. There was protrusion of the intervertebral disc into the adjacent vertebræ in 20 per cent (this does not constitute rupture of the nucleus pulposus). There was rupture of the nucleus pulposus posteriorly in 16 per cent and anteriorly in 6 per cent. The posterior longitudinal ligament supports the disc posteriorly to such an extent that rupture usually takes laterally to it. In 4 per cent only did the ruptured nucleus impinge upon the nerve root so that it is probable that some other disease-process, usually osteophytic, must be superimposed to produce symptoms. The posterior ruptures usually occur unilaterally, and because the posterior longitudinal ligament decreases in width as it proceeds caudally and flexion occurs in the lumbar region symptoms are more likely to be produced in the cauda equina (caudad to the first lumbar vertebra).

FRANK DORRANCE

Obstetrics and Gynæcology

Fetal Respiration in Relation to Atelectasis and Intrauterine Pneumonia. Snyder, F. F. and Rosenfeld, M.: *Am. J. Obst. & Gyn.*, 1938, **36**: 363.

The lungs are not collapsed before birth, but the alveoli are well formed and partly dilated, being filled with amniotic fluid. Breathing of air instead of fluid results in a rapid increase in the dilatation of the alveoli. The newborn is not drowned although the lungs are filled with amniotic fluid at the time of birth. Adequate aeration is promptly provided, since the elasticity of the alveolar walls permits an increase in size of the alveoli of such magnitude that the surface area now obstructed by fluid becomes relatively greatly reduced. Breathing of abnormal amniotic fluid containing debris which obstructs the respiratory passages may result in injury of the lungs before birth and cause atelectasis. Bacterial contamination of amniotic fluid may result in intrauterine pneumonia.

ROSS MITCHELL

Interruption of Early Pregnancy by Means of Orally Active Œstrogens. Parkes, A. S., Dodds, E. C. and Noble, R. L.: *Brit. M. J.*, 1938, **2**: 557.

Experiments have been carried out on the inhibition of implantation and the interruption of established pregnancy by the oral administration of two new œstrogens—ethinyl œstradiol and diethyl-stilbœstrol. Both of these substances, given by mouth, inhibit the effect of progesterone and prevent implantation of the blastocysts in rabbits. Small doses of diethyl-stilbœstrol prevent implantation in rats, while ethinyl œstradiol is highly effective in interrupting established pregnancy in rabbits.

ROSS MITCHELL

The Relation of the Pituitary Gland to the Menopause. Watson, B. P., Smith, P. E. and Kurzrok, R.: *Am. J. Obst. & Gyn.*, 1938, **36**: 562.

Eleven patients of ages ranging from 25 to 66 were injected with gonadotropic hormone, and the case reports are presented. The following conclusions were reached. The human ovary showed a loss of response to gonadotropic stimulation with age. There is a slight response in the fourth decade and a complete absence of response in the fifth decade and beyond. When the response is definite only one ovary may show this response, while the other may show no stimulation at all. This implies the concept that one ovary can cease function before the other. The injections did not induce the formation of normal follicles, but resulted in multiple cysts (in the reactive ovaries), varying from 5 mm. to 2 cm. in size. The menopause is due to a lack of response on the part of the ovary to gonadotropic hormones.

ROSS MITCHELL

The Suppression of Lactation by Oral Œstrogen Therapy. Foss, G. L. and Phillips, F.: *Brit. M. J.*, 1938, **2**: 887.

The indications which made it necessary to suppress lactation were stillbirth, miscarriage or monstrosity, death of the child, disease or illness of the mother (tuberculosis, heart disease, eclampsia), weaning for adoption or operation,

breast abscess and puerperal mania. The results have been consistently satisfactory. The ideal method is to start treatment soon after delivery, giving on the first day 2 doses of 5 tablets, each tablet containing 1,000 I.u. of œstrone, following with 5 divided doses of 2 tablets each, two-hourly, on the succeeding day or days if necessary. If treatment is not begun until the third day or later still it may be necessary to continue 2 tablets two-hourly for two to four days. No fluid restriction or aperients are necessary, and even binding of the breasts may be omitted in most cases. The average effective total dose is 20 to 30 tablets, which for hospital practice represents a cost of approximately 3 shillings to 4s. 6d. Later in the period of lactation this therapy has been found of great value for breast abscess. The most noticeable effect is the rapid softening of hard swollen congested breasts with almost immediate relief of discomfort. ROSS MITCHELL

Pædiatrics

The Causative Organisms of Broncho-pneumonia in Infants in Egypt. Abdel-Khalik, A. K., Askar, A. M. and Ali, Mohamed: *Arch. of Dis. Child.*, 1938, **13**: 333.

This comprehensive study describes the material from 233 cases of broncho-pneumonia in infants. The specimens were obtained by lung puncture during life. The technique of lung puncture is described and the possible complications mentioned. These are hæmoptysis, infection of the pleura, injury to the great vessels, and shock from pricking the pleura. All these are said to be easily avoided, and no complications of serious import were encountered in this series. An analysis is made of the bacteriology of the specimens obtained. Contrary to previous reports, the pneumococcus (12.6 per cent) was not the commonest cause of broncho-pneumonia in infants. It comes fourth in frequency after *H. influenzæ* (42 per cent); staphylococcus (36 per cent) and streptococcus (23.1 per cent). The authors were impressed by the frequency with which staphylococcus seemed to be the primary organism, and conclude that this organism plays a definite rôle in the causation of this disease in infancy. REGINALD WILSON

Urology

A Histological Study of the Effect of the Sex Hormones on the Human Prostate. Moore, R. A. and McLellan, A. M.: *J. Urol.*, 1938, **40**: 641.

During the past decade a large body of data has accumulated on the effect of androgenic and œstrogenic compounds on the male secondary sexual organs of various animals, notably the mouse and the rat. From these observations deductions concerning the effect of the sex hormones in man have been made, and theories of the etiology of benign hypertrophy of the prostate have been proposed. If all the observations and deductions are correct it follows that a logical non-surgical treatment for benign hypertrophy has been obtained. Clinical reports on treatment with an androgen in man during the past year have been encouraging but inconclusive. Lower and McCullagh have observed that the enlargement of the pituitary that follows castration may be prevented by injections of an expressate of testicular tissue. They proposed that benign hypertrophy is the result of overstimulation of the testis by the pituitary. The hyperactivity of the pituitary results from the lack of hormone of the testis. Clinical observations have proved that there is no significant enlargement of the pituitary in cases of benign hypertrophy in man and that in teratoma testis, where there is excessive gonadotropic hormone, the prostate shows no significant histological change. Finally, in cases of benign hypertrophy there is no appreciable increase in the amount of either the gonadotropic substance or male sex hormone in urine.

The present report is concerned with histological observations on surgically enucleated prostatic tissue after the injection of an androgen and after the injection of an œstrogen. The authors concluded that there is no significant restoration of the involuted prostate of presenility and no observable alterations in the histological appearance of the tissue in cases treated with either of these two hormones. There was, however, a conspicuous alteration in the urethral and ductal epithelium in those cases treated with an œstrogenic hormone.

J. VICTOR BERRY

Intraprostatic Injection of Sclerosing Solutions. Emmett, L., Lovelace, W. R. and Mann, F. C.: *J. Urol.*, 1938, **40**: 624.

The injection of solutions directly into the prostate gland for therapeutic reasons has been a subject of speculation by physicians for years. From Germany has come the interesting work of Payr, who reported rather favourable clinical results from the intraprostatic injection of Pregl's solution with pepsin in cases of prostatic obstruction owing either to benign hyperplasia or carcinoma. The authors reported the histopathological changes produced by intraprostatic injections of sclerosing solutions.

The end-result of injection of sylnasol into the prostate glands of dogs was a definite reduction in size of the lobe into which the solution had been injected. The reduction in size seemed to be associated with increase in the connective-tissue stroma, possibly with some reduction in size and number of the prostatic acini. There was no untoward reaction, and urinary symptoms of any kind were not observed in any of the experiments. J. VICTOR BERRY

Neurology and Psychiatry

Sciatica and Low Back Pain. Fincher, E. F. and Walker, E. B.: *South. Surg.*, 1938, 7: 97.

This report is based on an experience of 31 consecutive cases with sciatic pain in which lipiodol studies have been carried out. Of these patients 24 were shown to have a herniated intervertebral disc on fluoroscopic studies. The chief complaint in every case was pain. This was usually present in the low back region, radiating toward the hip, down the posterior aspect of the thigh, the lateral aspect of the leg, or the outer part of the foot depending on the spinal roots compressed. Subjective numbness was very commonly complained of, and, when present, was usually over the dorsum of the foot or the calf of the leg. More than half of these patients associated their pain with a definite injury. Careful neurological examination revealed positive findings in a large percentage of the cases. The most common finding was a diminished or absent ankle-jerk although this reflex was occasionally hyperactive. The knee-jerks were sometimes diminished or exaggerated but were more often normal. Next in frequency were sensory disturbances. Slight sensory diminution over the dorsum of the foot or the calf of the leg was the usual finding, although slight hyperæsthesia over the buttock or posterior aspect of the thigh was almost as commonly found. Total protein determination of the spinal fluid was reported as over 40 mg. per 100 c.c. in over half of the cases. Many cases showed a loss of the normal lumbar lordosis. This is the so-called "poker-spine" and is the result of muscle spasm. The diagnosis as well as accurate localization was proved in each case preoperatively by lipiodol studies. The site of the defect was most commonly in the region of the intervertebral space below the fourth or fifth lumbar vertebra. Often the lesion was removed through an approach where only a small portion of the laminal arch was removed. This allowed removal of the lesion without significant weakening of the spine. The patients in whom a ruptured disc was demonstrated and removed were uniformly relieved of their sciatic pain. FRANK TURNBULL

A Study of Fifty Cases of Bromide Psychosis. Curran, F. J.: *J. Nervous & Ment. Dis.*, 1938, 88: 163.

Bromides may remain in the body several weeks after medication has stopped. A replacement of more than 40 per cent of blood chlorides by bromides is fatal. It is generally agreed that the urine may be free of bromide when the blood bromide is high. The blood, therefore, must always be tested. During a six months' period at the Phipps Clinic at Johns Hopkins Hospital, Wuth found that 50 patients out of 238 admissions had bromides in their blood.

The following are the neurological findings in bromism; a mask-like expressionless face, double vision and sluggish pupillary reactions, ataxia of gait and speech, coarse hand tremors, increased sensitivity to pain and touch, twitching of the flexor muscles of the arms, abolition or diminution of gag, corneal, and abdominal reflexes. The most common form of bromide psychosis is delirium with fever, disorientation, ideas of persecution and vivid hallucinations, usually visual. Five of the 50 cases reported showed a Korsakoff picture. A psychosis, schizophrenia or manic depressive or general paresis may underlie the psychotic symptoms due to bromide.

The author notes that "Bromo-seltzer" contains bromides and acetanilide, and that a fluid drachm of "Bromidia" contains twelve grains of chloral hydrate. A. G. MORPHY

Therapeutics

The Treatment of Iron Deficiency Anæmia. Fowler, W. W.: *J. Am. M. Ass.*, 1939, **112**: 110.

Iron has been raised to the status of a specific remedy, but according to the author this has been accomplished more by the selection of cases for its use rather than by the introduction of more efficient preparations. Iron-deficiency anæmia occurs whenever the prolonged loss of iron in the form of hæmoglobin is more rapid than its replenishment from the dietary intake. It is encountered in cases of peptic ulcer, hæmorrhoids, and menorrhagia. Idiopathic hypochromic anæmia is a syndrome in which the blood loss is frequently unrecognized menorrhagia. Achlorhydria, which is practically always present, interferes with the proper absorption of iron from the food. Hypochromic anæmia of pregnancy appears to be identical with the idiopathic form, except that the maternal iron supplies are depleted by the fetus rather than by hæmorrhage. It is in these types of iron-deficiency anæmia that iron therapy is particularly effective. The second factor which has tended to produce a more satisfactory response to iron therapy has been the giving of adequate amounts of iron. This raises the question: What constitutes adequate amounts? The author studied in 8 cases the iron intake, iron excretion, and hæmoglobin regeneration. He found that 32.6 per cent of administered iron was retained; 2 per cent, approximately, of administered iron was utilized to form hæmoglobin; only 6.3 per cent of the retained iron was used for hæmoglobin formation. The recent experiments do not support the theory that iron acts purely as a form of replacement. There was no correlation between the degree of anæmia and the amount of iron retained. The function of the excess iron which increases the rapidity of hæmoglobin formation is not clear. Heath emphasized that all patients do not respond similarly to the same dose. The dosage recommended is iron and ammonium citrate, gr. 6; reduced iron gr. 3; ferrous sulphate 1 gr. per day. There

is no apparent need for the addition of vitamins, liver extract, or other metals to a simple iron preparation in the ordinary case. In his experience the intramuscular administration of iron has not been effective. LEYLAND J. ADAMS

Sulphanilamide in the Treatment of 106 Patients with Meningococcic Infections. Waghelstein, J. M.: *J. Am. M. Ass.*, 1938, **111**: 2172.

The author reports a series of 106 patients with meningococcic infections treated at the Sydenham Hospital, Baltimore, with 19 deaths, a fatality rate of 18 per cent. The case fatality rate in the adequately treated group was 12 per cent. When sulphanilamide alone was used the fatality was 15 per cent; under the combined treatment with serum and sulphanilamide the fatality was 24 per cent.

The spinal fluid cultures were more consistently sterile after from 12 to 24 hours of treatment in those cases in which sulphanilamide was taken every four hours by mouth or nasal catheter rather than when given every 12 hours by hypodermoclysis. The number of lumbar punctures in treatment was markedly reduced. The complications due to sulphanilamide therapy were infrequent and very mild. The number of recurrences were reduced. Those complications due to meningococcic infections were not significantly reduced in occurrence.

The daily dosage in adults was between 5 and 6 grams, in infants 250 mg. per kilogram of body weight, and in older children approximately 1 g. to 20 pounds of body weight. S. R. TOWNSEND

Treatment of Acute Nephritis in Children. de Filippi, F.: *Revista de la Asoc. Med. Argentina*, 1938, **52**: 957.

Volhard's treatment consists in suppression of food and of the water intake and administration of small quantities of orange juice for from five to six days. De Filippi reports satisfactory results from the treatment in a large number of children who were suffering from acute diffuse glomerulitis. Seven cases are reported. A cathartic of castor oil or magnesium sulphate is given to the patients immediately before starting treatment. Orange juice is administered alone for the first 5 to 6 days and then in association with food and water for one or two more weeks. The daily allowance increases from 75 to 100 c.c. of orange juice during the first two days to 600 c.c., during the last 3 days, and also during the following two weeks in which the diet is reestablished.

The arterial pressure, weight and diuresis are determined before and in the course of the treatment. As a rule the arterial pressure and diuresis become normal and œdema diminishes within two to three days. The loss of weight depends on the lowering of the œdema. Hæmaturia diminishes early in the course of the treatment, except when due to focal infection, which must have the proper attention. The diet is slight during the first week in which it is reestablished, and is slowly increased so as to be normal by the end of the second week. The treatment is well tolerated; acute cardiac and renal complications or the development of chronic renal disease do not follow. Permanent recovery takes place within three weeks or a month in all cases of acute and subacute forms in which there are no complications.

S. R. TOWNSEND

Vitamin C in the Treatment of Whooping Cough. Gairdner, D.: *Brit. M. J.*, 1938, **2**: 742.

The use of vitamin C as a remedy for whooping cough originated in Japan on the basis of experiments which showed that the vitamin inhibited the growth and toxin production of *H. pertussis*. Canadian workers reported that vitamin C unsaturation was common in cases of this disease. A standard dosage of ascorbic acid was worked out sufficient to saturate every case within a few days. These authors reported clinical improvement of symptoms when the vitamin was used as treatment in a series of 27 cases. There were no controls.

The present communication duplicates their method of treatment in a series of 21 cases and compares the result with 20 control cases. The author found that the average duration of symptoms and total duration of illness as well as average weight gained per week were practically identical in the treated and control cases. It is concluded that the beneficial effect of vitamin C upon the course of whooping cough is as yet unproved. REGINALD A. WILSON

The Importance of Diet and General Treatment in Dermatology. Barber, H. W.: *The Practitioner*, 1939, **142**: 1.

These sixteen pages will enrich the knowledge of any medical practitioner. Dermatologists differ much as to the importance of diet, though there is some agreement as to general treatment. A sedentary person, working indoors, with a grossly excessive diet is a prey to numerous dermatoses. Contrast the clear skin of the trained athlete on a diet planned with intelligence. He is seldom affected, save by infection or trauma. The skin of modern women and children is much improved by the decrease of clothing and increase of exposure and cleanliness. Seborrhœic skin always contains an excess of skin fat, favouring the growth of *Staph. albus*, acne bacillus, and pityrosporons. Compare the smooth dry skin of the ascetic with that of the greasy, pimply gourmand.

The "allergic subject" often becomes sensitized to certain foods or physical agents, or both, and skin disease soon develops. The incomplete digestion of starches is often an etiological fac-

tor. There is often a lack of balance of the endocrine autonomic system. In psoriasis it is agreed there should be a restriction of carbohydrates and fats, and that alcohol in any form should be forbidden. C. R. BOURNE

Pathology and Experimental Medicine

Erythroblastosis. Hellman, L. M. and Hertig, A. T.: *Am. J. Obst. & Gyn.*, 1938, **36**: 137.

With one exception no attempt has been made to determine the incidence of erythroblastosis fetalis in a large obstetric service. Such a record this article furnishes. Those infants who were born with hydrops were listed under that heading even if they showed icterus; those who showed icterus without hydrops were listed under icterus, although they might later show anæmia; those listed under the heading "congenital anæmia" showed that symptom only of the three manifestations of erythroblastosis, namely, hydrops, icterus, and anæmia.

The incidence of hydrops was found to be approximately 1 in 2,000 births. Although the history of toxæmia in the mother is five times as great in the hydropic cases as in the general clinic, the authors feel that toxæmia is not a cause of hydrops but an expression of disturbed maternal metabolism. The infants averaged slightly less weight than the normal; although the figure was not corrected for prematurity it is assumed the correction would not alter the observation. The placentæ were heavy, averaging 1,183.5 grams, giving a fetal placental ratio of 3 to 1 instead of the normal 6 to 1. All presented a typical pathological picture. The infant mortality was 100 per cent. The average maternal age at birth of the hydropic infant was 31.6 years, and the average parity was 5.2, thus confirming the opinion that erythroblastosis occurs infrequently in primiparæ and is a disease of the middle or late child-bearing period.

In view of the ideas put forward by Darrow that this condition is caused by the mother having manufactured immune bodies against fetal hæmoglobin, and that once a child is born with erythroblastosis all subsequent children will exhibit it, it is of interest to note that in these 13 families 3 mothers had had subsequent normal children following the birth of the hydropic children. Six mothers had had no subsequent pregnancies. Of the 7 who had had subsequent pregnancies one had had a second hydropic infant, and one had had two more hydropic infants, and two had had induced abortions. Thus of the five mothers whose six subsequent children came to term, three had each a normal and two had three hydropic children between them.

In the icteric families, there were 20 icteric children born to 19 mothers. The incidence was 1 in 1,500 deliveries. The average age of the mother was 30.1 years, and the average parity was 3.4. Following the birth of the first icteric child in the family there were 3 normal children, 3 stillbirths, 1 hydropic infant, and 12 with icterus. Twelve mothers had had but 1 icteric child which was the last in 10 cases. In 1 case it was followed by a normal child, in one by a miscarriage at 10 weeks. Four mothers had had two icteric children, the last two in the family in each case. One mother had had her last three children with icterus gravis; one had had her first, third, fourth, fifth and sixth all die of jaundice in a few days. The second child was not jaundiced. One mother had had a hydropic infant follow the one with icterus. Thus children born after the birth of an icteric child had an 80 per cent chance of having the disease recur in them. Early and adequate diagnosis, and repeated and early transfusions are emphasized as essential to the preservation of the lives of these infants. MADGE THURLOW MACKLIN

The Behaviour of the Hæmoglobin after Blood Transfusion. Sibley, W. L. and Lundy, J. S.: *Surg., Gyn. & Obst.*, 1938, **67**: 293.

The author has proved experimentally that hæmoglobin values following "reactions" with blood transfusions are only about 50 per cent of the usual 9 per cent increase in recipient hæmoglobin values from 500 c.c. of citrated blood, tested by the Cenco-Sheard-Sanford photelometer on the first, second, fourth, sixth, eighth and tenth days after transfusion. A reaction was considered to occur when chills and a temperature reading of 100° F. were noted.

FRANK DORRANCE

Hygiene and Public Health

The Nature of Mineral Particles in Sputum and Ash of the Lungs of Silicotics. Burke, H. E. and Kerr, P. F.: *J. of Indust. Hygiene & Toxicol.*, 1938, **20**: 535.

Selected portions of the lung and lymph nodes of 4 persons who had died of pulmonary tuberculosis, but who had had no occupational exposure to siliceous dusts, were ashed and examined by optical methods and by x-ray diffraction patterns. No evidence of the presence of sericite, feldspar or quartz was found. The ash of the lungs of 14 of 15 cases of silicosis and a composite sample of the ash of 8 former granite workers were found to contain quartz particles. No sericite was found in the ash of any of the proved silicosis cases.

This study indicates the value of petrographic studies in silicosis and doubtful silicosis. A relatively new method—the x-ray diffraction pattern—is utilized along with the more common optical methods. An attempt to identify the mineral particles found in the sputum of silicotics was not entirely satisfactory; undoubtedly the development of a technique which would

identify these particles in doubtful cases of silicosis would prove a helpful diagnostic aid.

FRANK G. PEDLEY

Non-Rheumatic "Growing Pains" and Subacute Rheumatic Fever. Proc. Am. Rheum. Ass., 5th Annual Meeting, San Francisco, June 13, 1938, Shapiro, M. J.: (Reported in the *J. Am. M. Ass.*, 1938, **111**: 1960).

Shapiro reported on the follow-up study of 200 children who complained only of leg-pains. The period of follow-up was three years. None of the children presented any evidence of chronic rheumatic infection. These children complained of pain primarily in the lower extremities, usually at the end of the day and often at night. Most of them were in normal health; none of them had developed rheumatic heart disease. In the opinion of the author the syndrome is so common in healthy school children that it is clear they are not suffering from rheumatic fever. The lay idea which ascribes these pains to growth is probably correct. The mechanism of pain production is not clear. In discussing the paper a number of physicians expressed concurrence in Dr. Shapiro's views.

FRANK G. PEDLEY

Obituaries

Dr. William Chestnut died on February 7, 1939, of coronary thrombosis at his residence, in his 72nd year. He was born in County Antrim, Ireland, graduated in Arts, and had one year's study in theology from McGee College, Londonderry. Coming to Canada 41 years ago, he completed his theological course in Manitoba College. He took up the study of medicine with the view of entering the foreign mission field and graduated in 1898, receiving the University Silver Medal, the Lt.-Governor's Silver Medal, and the Munro-Proctor Gold Medal. Owing to an eye accident he did not enter the foreign mission field, but began practice in Winnipeg. He was Medical Superintendent of the Winnipeg General Hospital from 1900 to 1903, and then resumed private practice. For a number of years he was on the Honorary Attending Staff of the Winnipeg General Hospital, and was also Assistant Professor of Medicine in the Faculty of Medicine.

Dr. Arthur Eden Fraleigh, of St. Mary's, Ont., died on January 17, 1939, in his sixty-ninth year. Dr. Fraleigh was the son of the late Mr. and Mrs. George Fraleigh, of St. John, London Township. He entered the University of Western Ontario and graduated in 1892. He practised first in Arva. He came to St. Mary's slightly over forty years ago. He was the local M.O.H.

Dr. Fraleigh was never in good health since his return from the Great War where he served in the Medical Corps. He enlisted near the beginning of the war in the Tenth Canadian Stationary Hospital formed by the University of Western Ontario.

Dr. William Grant, of Wolfville, N.S., died on February 5, 1939. Born at Big Bras D'Or, N.S., in 1862, Dr. Grant spent his earlier years teaching school before entering Dalhousie University to study medicine. He graduated in 1892, and for the next thirty years practised his profession in Port au Basque, Newfoundland. Coming to Wolfville in 1921, he was active in the life of the community and a member of the Nova Scotia Medical Society to the time of the illness which led to his death.

Dr. John Forster Orr died in Chicago, Ill., on January 8, 1939. He was born in Kleinburg, Ont., in 1859, and a graduate of Victoria University (1886). He was well known as a surgeon in Chicago and retired approximately fifteen years ago.

Dr. Orr was one of a family of physicians. His uncle was Dr. J. O. Orr; one brother was the well-known archæologist, Dr. R. B. Orr, curator of the Provincial Museum in Ontario; another, Dr. J. O. Orr, one time manager and editor of the *Ontario Medical Journal* and manager of the Canadian National Exhibition. He was a cousin of the late A. Orr Hastings and of C. J. Orr Hastings, Toronto's former Officer of Health.

Dr. William Henry Rennie, Portage la Prairie, died suddenly on February 6, 1939, aged 66. Born in Wellington County, Ont., he graduated in medicine from the University of Toronto, and practised in 1909 at Wardville, near London, Ont. In 1910 he went to Portage la Prairie and continued there in active practice up to the time of his death. He was Officer of Health for the Rural Municipality of Portage la Prairie, a former President of the College of Physicians and Surgeons of Manitoba, and a member of the Executive of the Manitoba Medical Association. He is survived by his widow, a daughter, and three sons, two of whom, Dr. James Rennie and Dr. Jack Rennie are taking post-graduate work in Edinburgh, Scotland.

Dr. Lee Anderson Richmond, of Hamilton, Ont., died on January 16, 1939, aged fifty-six. Dr. Richmond had practised in Hamilton since the Great War. Born in Hamilton, he received his preliminary education there, later going to Western University, London, and then to the University of Toronto, from which he graduated in 1909.

Dr. William Edgar Robertson, of Milton, Ont., died on January 16, 1939, in his sixty-first year. Dr. Robertson was born in Milton and was educated at Jarvis Collegiate and the University of Toronto. He graduated in 1900 and in 1906 left for the mission fields of China where he spent 21 years. He was responsible for the erection of a hospital in Hengchow, Hunan Province, for the American Presbyterian Mission Board. Dr. Robertson returned to Canada in 1927, taking up residence in Milton.

Dr. Stephen Sinclair Slaunwhite died at Windsor, N.S., on January 12, 1939. Dr. Slaunwhite graduated from Dalhousie University in 1896. His life was devoted to his profession at Rose Bay, N.S., until his retirement four years ago. He was 72 years of age.

Dr. William James Stevenson, of Aurora, Ont., died on January 22, 1939, in his seventy-fifth year. He was a graduate of Trinity University, Toronto (1887). He was M.O.H. at Aurora and had practised his profession there for almost fifty years.

Dr. Marjorie E. Ward, of Renfrew, Ont., died on January 25, 1939. Born in Renfrew 68 years ago, she was a daughter of the late James Ward and his wife, formerly Catharine Stewart. She attended public and high schools in Renfrew and graduated in medicine from Queen's University about the turn of the century. She never practised her profession, but for a few years after her graduation she was actively connected with medical institutions in Montreal and New York.

News Items

Alberta

In the elections to the Council of the College of Physicians and Surgeons of Alberta, Dr. P. M. Campbell, M.L.A., declined to run again, and Dr. Mulloy of Cardston was elected to take his place, representing Lethbridge constituency. Dr. R. B. Francis, of Calgary, and Dr. W. V. Lamb, of Camrose, were elected to succeed themselves, and, this by acclamation. The Council for 1939 is as follows: Drs. W. V. Lamb, Camrose (President); H. Parsons, Red Deer (Vice-president); W. G. Anderson, Wardlow; R. B. Francis, Calgary; J. K. Mulloy, Cardston; A. E. Archer, Lamont; W. A. Wilson, Edmonton.

The Alberta Highways Board has prepared forms for medical examination for all those seeking licenses to drive buses or trucks. These call for a very strict examination, and, rightly so, for the responsibility of these men is really greater than that of railway engineers. They have no despatchers to control the movement of traffic, and in addition to being drivers, are conductors, baggage men and expressmen. For this examination the College of Physicians and Surgeons has set a fee of $5.00 as very reasonable for the work involved.

In 1938 special plates were furnished all physicians who desired them and were taken up by about half the practising physicians. The type was the number prefixed by the word "MED" followed by a cross. Some members objected as they considered the number too striking and subject to identification by addicts. This year there will be a series of numbers reserved for the profession, 60-001 to 60-999, which ought to meet the requirements.

Owing to the difficulty of placing and adjusting foreign European medical practitioners, and also to the fact that Alberta has already more medical practitioners than can earn a reasonable living, the Council has decided for the present that only British subjects who meet the requirements will be registered.

The Council decided to cooperate with the Royal College of Physicians and Surgeons of Canada in the matter of amendments to the Act, and further establishing a uniform system of "specialist" standing for all Canada. Alberta amended the Medical Profession Act some years ago whereby no one could call himself "specialist" without first presenting qualifications to the University and receiving therefrom a certificate of standing.

Complaints are being received that the spurious remedies of former days are being largely broadcasted at the present time, but apparently more pressing matters take the attention of the broadcasting authorities, and this question goes merrily on unsolved.

The annual meeting of the Canadian Medical Association, Alberta Division, will be held in Edmonton, September 21, 22, 23, 1939, according to present arrangements. The four western provinces are holding their conventions on dates which will permit a visit from the national President-elect, Dr. Frank Patch, and the General Secretary, Dr. T. C. Routley.

G. E. LEARMONTH

British Columbia

Dr. T. C. Routley, the General Secretary of the Canadian Medical Association, paid a welcome visit to us during the latter part of January. This visit was very well timed as he was able to attend two important meetings.

The first was a meeting of the Health Insurance Committee of the College of Physicians and Surgeons and the Nucleus Committee on Economics of the Canadian Medical Association, the members of which were discussing a questionnaire sent to them by Dr. Wallace Wilson, Chairman of the Committee on Economics of the Canadian Medical Association. This questionnaire included several very important features, and both Dr. Routley and the Committees profited by the discussion, as he was able to give us several most important facts regarding the other provinces in Canada and he in turn was able to gather considerable information regarding British Columbia.

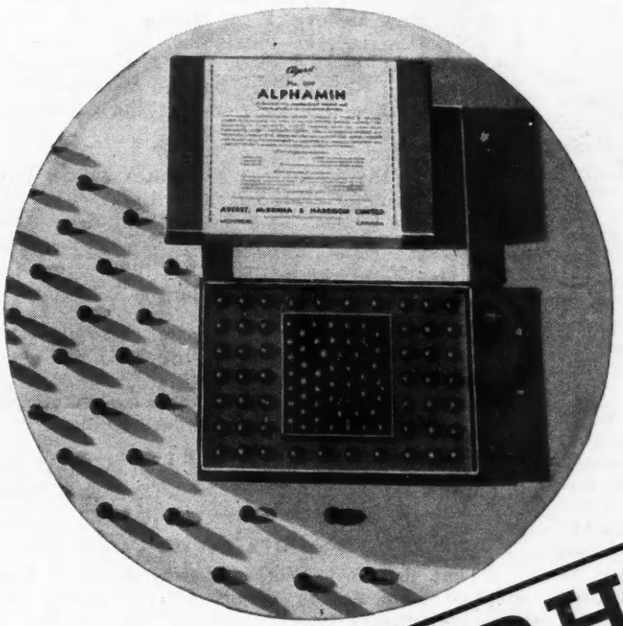
The other meeting was with the Board of Directors of the British Columbia Medical Association at their regular meeting when representatives from various parts of the province were present and again economic questions were discussed.

Under the auspices of the Greater Vancouver Health League a public meeting was held in the Crystal Ballroom of the Hotel Vancouver on January 30th, to present the problem of venereal disease to the public. The Attorney-General of the province had expected to attend but was detained by emergency business in Victoria, but the meeting was opened by His Worship, the Mayor of Vancouver, and the Honourable G. M. Weir, Provincial Minister of Health and Education was among the speakers, who included, also, the Medical Officers of Health and representatives of medical associations.

The chief speaker of the evening was Dr. D. H. Williams, Director of the Division of Venereal Disease of the Provincial Public Health Department, and he delivered a striking address. The manner of it was dignified and restrained, but he did not mince matters in speaking of the problem of venereal disease and its causes as he sees them after a very extensive experience in the clinics of the province. He made an eloquent appeal to all forces of the community to aid in the suppression of prostitution which, his figures showed, is the cause of 80 per cent of venereal disease infection in Vancouver. By many instances he showed that the weakest point in the present handling of the problem is the lack of enforcement of the Criminal Code dealing with prostitutes and brothels by the police, and amid the applause of the audience he demanded that the law be enforced by those whose sworn duty it is to enforce it. An audience of 2,500 people packed the ballroom, its galleries and its approaches, and listened with rapt attention to the speaker. It had been hoped to broadcast this address but the CBC would not allow it unless the words "prostitute" and "prostitution" were changed to "promiscuous" and "promiscuity", and the words "brothel" and "bawdy house" were not permitted. We cannot regard it as a right state of affairs when a province, amongst whose functions is Public Health, cannot use the air to further its work, and when such a reactionary and early Victorian attitude is adopted by a corporation which while with one hand it refuses to allow a responsible body to carry to the public warnings and teaching regarding venereal disease, with the other hand accepts money from firms which advertise quack medicines and pain-killers without any censorship. This address of Dr. Williams' should have reached every home in the province.

A new departure was made and a new precedent was set in the enforcement of Health and Medical Acts when the Division of Venereal Disease of the Provincial Government was instrumental in prosecuting before a city magistrate an irregular practitioner who was guilty of treating venereal disease without being qualified to do so. This man was fined heavily with an alternative of a jail sentence. It is significant that this prosecution was carried out by the Attorney General's Department instead of being left to the College of Physicians and Surgeons of British Columbia, which has hitherto been obliged to prosecute in all violations of the Medical Act. We regard this as distinctly a step in the right direction.

J. H. MACDERMOT



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Manitoba

According to the report given by Dr. E. L. Ross at the annual meeting of the Sanatorium Board of Manitoba, there were in 1938 in Manitoba 370 deaths from tuberculosis, 245 among white people, and 145 among Indians. Although Indians form only 2 per cent of the province, they are responsible for one-third of the deaths from tuberculosis; their tuberculosis death rate is 25 times as great as for white people. The tuberculosis deaths were 65 less than in 1937, a decrease of 14 per cent. Still more striking and encouraging is the reduction in the number of the residents of Manitoba who have been infected. Twenty-five years ago over 50 per cent of school children were infected and over 75 per cent of young adults. Now tuberculin surveys indicate that less than 10 per cent of school children and about 20 per cent of young adults have had contact with tuberculosis. This should present a more hopeful future for the rising generation.

It is gratifying to learn that among patients in the Manitoba Sanatorium at Ninette the percentage admitted classified as having minimal or only moderately advanced disease has increased. The average age on admission was 30 years. There is a tendency to longer stay in the sanatorium. The average duration of treatment was 418 days, 18 days longer than the 1937 average. Two hundred and sixty-three operations were performed at Manitoba Sanatorium, an increase of 24 per cent over 1937, and there were no operative deaths.

The travelling clinics had their biggest year; a total of 7,741 examinations were made at 79 clinics held in 51 centres. In this way 158 new discoveries of tuberculosis were made, and of these only 16 per cent were found to have far advanced disease.

Tuberculin testing was done on students of the Winnipeg Normal School, Faculty of Education of the University and the University Summer School; Public Health Nurses; inmates of the Manitoba Home for Boys; the Home of the Good Shepherd; pupils at Norwood School, Wasawa School, and Brandon Normal School; nurses at Grace Hospital, Winnipeg, Winnipeg General Hospital, Brandon General Hospital, and Dauphin General Hospital; and students of the Faculty of Medicine.

A film prepared by the United Artists Corporation, "Behind the Shadows", illustrating the modern treatment of tuberculosis, was shown at 36 theatres throughout the province and 14 in Winnipeg.

An exhibit from the laboratory of the Manitoba Sanatorium was sent to the meeting of the American Society of Medical Technologists at San Francisco. A lesson on tuberculosis was sent to 2,200 schools in Manitoba, and prizes were given for the best essays based on it.

The formal opening of the new Out-Patient Department of St. Boniface Hospital took place in the evening of January 19th. The guests assembled in the Auditorium, which seats 400, and Dr. J. D. Adamson acted as Chairman. His Honour, the Lieutenant-Governor, was present. Addresses were given by the Hon. I. B. Griffiths, Minister of Health and Public Welfare, Dr. S. G. Herbert, Chairman of the Honorary Attending Staff, Rev. Father Bourque, of St. Boniface College, Judge Joseph Bernier, Sydney E. Smith, President of the University of Manitoba, and Dr. C. E. Corrigan, Director of the Out-Patient Department. Dr. J. J. Trudel contributed a reading. In addition there was music by the String Ensemble and a solo by Mrs. Olga Irwin.

The new building is connected with the Hospital and Nurses' Home by an underground tunnel. The equipment of the building is very fine. Sound absorbing tiles in the ceilings greatly reduce noise. The building cost $445,000.00. A clinical diagnostic x-ray has been installed as a self-contained unit.

The Faculty of Medicine held a post-graduate course in Pædiatrics February 14th, 15th, 16th at the Children's Hospital, Winnipeg. Dr. Joseph Brenneman, Chief of Staff of the Children's Memorial Hospital, Chicago, was guest-speaker. Other speakers at the course were Drs. J. M. McEachern, A. E. Deacon, H. E. Popham, Gordon Chown, Harry Medovy, F. A. Macneil, C. H. A. Walton, J. A. McGillivray, E. Patriarche, Bruce Chown, J. D. McEachern, A. R. Birt, O. J. Day, J. N. Crawford, I. H. Beckman, and G. Shapera. Dr. and Mrs. Gordon Chown held a reception for those taking the course at their home on February 15th.

In 1938 there were but six deaths among Winnipeg mothers, giving a maternal mortality rate of 2.2 per thousand live births. This is the lowest rate recorded in Winnipeg.

ROSS MITCHELL

New Brunswick

Dr. H. A. Farris, of Saint John, is at present in the United States doing post-graduate work.

Dr. A. L. Gerow, of Fredericton, has recently resumed his practice after a long convalescence.

Captain Howard Bustin had been gazetted a Major in the C.A.M.C.

A. S. KIRKLAND

Nova Scotia

That the Nova Scotia tuberculosis death rate had dropped from 213 to 93 per 100,000 during the last twenty-five years was pointed out by the Rev. H. G. Wright, Vice-president of the Canadian Hospital Association, in an address at Windsor; during the same period the cancer death rate had doubled. In the course of his talk the Rev. Mr. Wright dwelt on the fact that Nova Scotia is the only province in Canada that pays hospital fees of non-residents who are unable to do so; that the annex system of fighting tuberculosis, originated by Dr. G. H. Murphy while Minister of Health, had done much to lower the mortality rate; that the association council were to be commended for their resolution that hospitals should gain their revenue from something better than the gambling instincts of the people.

Following the request of the Glace Bay miners that a clinic system of medical care for coal workers be established, embracing all the specialties, a committee of local physicians have submitted proposals for acceding to the request. While plans have not been completed it seems unlikely that the miners will accept them because of the increased expenditure necessary to include all specialists on their "check-off" system of payment.

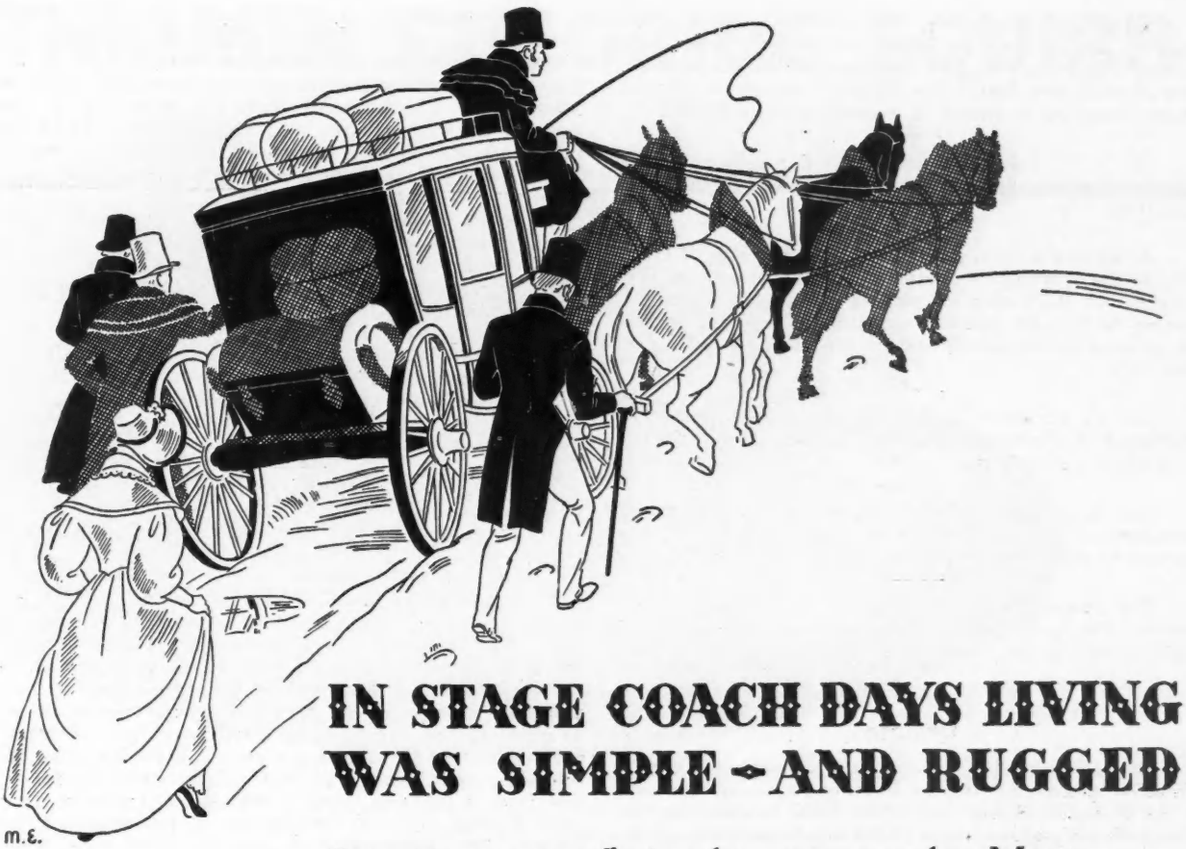
Dr. L. R. Ryan (Dal. '38) has taken up practice in Dingwall, to serve the northern portion of Cape Breton Island, which through past winters has been without medical aid.

A new hospital for Springhill seems likely, following a meeting presided over by Dr. H. L. Simpson at which the Hospital Board met representatives of the United Mine Workers. Suggestions were that the miners contribute 25 cents weekly toward free hospital treatment and that an annual contribution be accepted from the Dominion Coal Company. The contract suggested is similar to that in operation at Glace Bay.

Drs. J. R. Corston, F. R. Little and C. S. Morton were appointed as the medical advisory committee of the Victorian Order of Nurses at its annual meeting in Halifax.

The Middleton Soldiers' Memorial Hospital reported a busy, successful year, with more than 6,000 hospital bed days. Drs. L. R. Morse and C. F. Messenger are members of the Board.

Dr. H. D. Chisholm, of Springville, has been appointed Health Officer for Pictou, and Dr. M. R. Young, Pictou, as jail physician.



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Additional members to the board of trustees of the Eastern Kings Memorial Hospital included Drs. Lalia Chase, F. F. Chute and P. S. Cochrane. Dr. A. C. Fales was elected president. The financial report of the year showed receipts in excess of expenditures by $3,000.

Dr. J. C. Acker has been elected president of the Halifax Branch of the Nova Scotia Society for Crippled Children.

A resolution from the United Mine Workers of Glace Bay to the Workman's Compensation Board will ask that they follow the custom of paying one month's hospitalization to injured miners regardless of whether or not, by private arrangement, miners are already entitled to free care.

Dr. F. L. Moore (Dal. '24) has been appointed Professor of Preventive Medicine at Long Island College of Medicine, New York.

Dr. R. J. MacDonald (Tufts, '07), a native of Heatherton, and till recently of Aguathuna, Nfld., has opened an office in Antigonish.

The Dawson Memorial Hospital, of Bridgewater, reported 1938 as the busiest year in its history, with total admissions of more than one thousand.

ARTHUR L. MURPHY

Ontario

His Honour the Lieutenant-Governor of Ontario officially opened the Wilcox Pavilion, a recent addition to the Mountain Sanatorium, Hamilton, on January 7th. This addition replaces some of the old frame units of the sanatorium which were associated with the early developments of the institution thirty years ago. The sanatorium now has accommodation for about 700 patients, making it the largest in Canada.

Early in January it was announced that William H. Wright, vice-president of Wright-Hargreaves and Lake Shore Mines, had made a gift of $100,000 for the construction of a new wing to the Kirkland District Hospital, the construction to start as soon as possible. This addition will provide an addition of 50 beds to the present sixty-two. This is a development from a Red Cross outpost hospital which began with 14 beds in 1926.

The Toronto Western Hospital is launching a campaign for $500,000 in order to complete the cost incurred in an expansion and modernization program which represent an outlay of nearly one and one-half million dollars.

An interesting experiment is being carried on in the town of Gananoque in an attempt to reduce the town's hospital bills. Rather than send its indigent patients to the Kingston General Hospital, the town will have them attended at home by local physicians who will be paid for their services. This appears to be a recognition of the fact that physicians do a great deal of free work and that their services for the indigents of a municipality should be compensated. It will overcome the tendency for physicians to send into hospital those patients for whom they have not been receiving payment for indigent care.

Under the Gananoque plan the six physicians in the town will undertake to treat persons on relief, in receipt of Old Age Pensions, and those nearly on relief. The payments will be made jointly by the town and the Welfare Board.

Dr. Malcolm Stalker, who has been in practice in Walkerton for fifty-seven years, has resigned as Medical Officer of Health, a post which he has held for twenty-five years.

The Ontario Cancer Commission have announced the personnel of a sub-committee of two doctors who will go to Bracebridge and make personal observations on the case-histories of the patients treated there for cancer by Miss Caisse. The Committee have also been investigating some of the cases treated by Dr. J. E. Hett. The Commission is said to have in preparation an interim report of its activity since its first meeting last September.

Dr. Peter McLaughlin, who has completed a half century as medical practitioner in the town of Winchester, was recently the guest of honour at a complimentary dinner at which he was presented with a gold-headed cane by his fellow physicians.

Dr. Alfred McKee Large, a graduate of the University of Toronto, 1936, has been awarded the Hallett Prize of the Royal College of Surgeons of London, England, for obtaining the highest marks in the primary examinations.

Dr. H. V. Morris (Queen's, '37) is at present in London, Eng., with Mrs. Morris. They are leaving for India at the end of February where Doctor Morris will be attached to the Indian Medical Service.

Dr. Gordon Jackson, in his report to the Toronto Board of Health, states that the infant death rate was the lowest on record, and that living births in 1938 totalled 10,566, a rate of 16 3 births per thousand population. There has been a steady decline in birth rate since 1930 until last year when it was 6 per cent in excess of the previous year. The death rate per thousand persons for 1938 was 10.8 per cent, a little less than the preceding year, which was 10.9. There were two fatalities from diphtheria, both in the same family, neither child having received the benefit of immunization by toxoid. The maternal death rate per 1,000 live births was 3.8, and this included the deaths of 15 non-resident mothers. Not since 1919, when it was 4.4, had there been such a low rate. The tuberculosis death rate was 38 per 100,000 population.

J. H. ELLIOTT

United States

The International Assembly of the Inter-State Post-graduate Medical Association of North America announces its European Assembly for 1939. The *S.S. Washington* will leave New York on May 17th. The countries to be visited are: England, Ireland, Scotland, Norway, Sweden, Denmark, Holland, Belgium, Switzerland and France.

The *S.S. Statendam* is due to return to New York on July 11th.

For further information address Dr. W. B. Peck, Managing-Director, Freeport, Illinois, or the Manager of Travel Department, American Express Company, 65 Broadway, New York, or either of the following offices of the American Express System in Canada, 1188 St. Catherine Street West, Montreal, Que., 25 King Street West, Toronto, Ont.

General

The Tenth International Congress of Military Medicine and Pharmacy will be held in Washington, D.C., from May 7 to 15, 1939.

Registration is open only to medical and pharmaceutical officers, active or retired, of the armed forces and related branches. Official delegates, however, must be accredited by their respective governments.

Detailed information relative to the Congress will be furnished upon request by the Secretary-General, Tenth International Congress of Military Medicine and Pharmacy, Army Medical Library, Washington, D.C. The American Express Company, travel representatives of the Congress, will furnish data on passport requirements, steamship and railroad rates, trips within the United States, etc., through their branch offices.

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FILTRATE FACTORS—Jukes-Lepkovsky factor value of 27 per 1 cc.
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Book Reviews

The Fundamentals of Internal Medicine. W. M. Yater, A.B., M.D., M.S., 1021 pp., illust. $9.00. Appleton-Century, New York, 1938.

This work is a clear and practical presentation of the essentials of clinical medicine. It is not another "Practice of Medicine", which is apt to be too detailed for ready reference, nor is it a handbook of medicine, which is generally superficial. Striking an admirable balance between the two extremes, the author has shown an originality of presentation wherein lies the chief value of the book. Each group of diseases is considered in a section and at the beginning of each section there is a discussion of the general principles involved in the clinical consideration of the group of diseases concerned. For example, in the section dealing with diseases of the blood vessels there is a preliminary outline of the main diseases of the blood vessels, the nervous control of the vascular system, the arterial blood pressure, vascular crises, organic vascular occlusion, causes of pain in vascular occlusion, and the methods employed in the study of peripheral vascular disease. Such a method serves to bring the diseases of a group into perspective and to emphasize the physiological basis of diagnosis and treatment. There is just the right amount of dogmatism desirable in texts of this kind, the emphasis at all times being placed upon the essential established facts of each condition. At the end of each section there is a list of recommended texts and monographs dealing with the diseases of that section. The tables of differential diagnosis are unusually clear.

This is a book of exceptional importance and value. It reflects clinical judgment, teaching experience and a regard for physiology as the basis of medicine. It should be of great value to the medical student and to every practitioner wishing to have concise accurate knowledge of the medical aspects of disease.

The Pathology of Diabetes Mellitus. S. Warren, M.D. 2nd ed., 246 pp., illust. $4.75. Lea & Febiger, Phila., 1938.

This book needs no introduction nor recommendation; it is the second edition of a work which has become a standard reference on the subject. Since the publication of the first edition (1930) there have been a number of changes in the treatment of this disease—use of more liberal amounts of carbohydrate with moderate restriction of fats, the high carbohydrate-low calorie diet, protamine insulin, protamine zinc insulin, etc.—some of which have undoubtedly altered the pathological picture. This alone has warranted a second edition, and a number of the observations which it contains are of particular interest.

Arteriosclerosis is a still more major problem than in the past, and the author is not certain whether this is due to diabetes itself or to its treatment. That the increased incidence is not due entirely to the increased duration of the diseases is obvious from autopsy findings amongst diabetics under 50 years of age. Having arteriosclerosis and dying of it are obviously not synonymous terms. It is, therefore, still more disturbing to find that these autopsies showed that about 10 per cent of those under the age of 50 actually died of this complication. As to etiology, the author is still very much impressed with the disturbances of lipoid metabolism, particularly the cholesterol.

In view of the newer knowledge of hormones in general and the tendency to pay less attention to the pancreas in diabetes than in the past, the author's observation about obesity is of interest. The harmful effects of excess weight are attributed to "abnormal strain on the islands of Langerhans". Seventeen years ago Allen concluded from his experiments on animals that the harm done by excess intake of food is directly the result of impairment of pancreatic function—though there must be some relationship between the amount of active tissue in the body and the amount of pancreatic tissue, pancreatic function is not spared appreciably when the same quantity of food is metabolized by fewer cells but only when the same number of cells metabalize a reduced quantity of food.

The short chapter on medico-legal aspects of diabetes mellitus and diagnosis of diabetes from post-mortem material is a new and valuable addition. The chapter on autopsy and staining methods is of special interest to pathologists. The warning, however, that the pancreas is extremely labile and that autopsies should, therefore, be performed as soon after death as possible is applicable to all concerned with this disease.

The Cause and Prevention of Disease. W. H. Perkins, M.D. 713 pp. $7.50. Lea & Febiger, Phila., 1938.

Perkins says, "Faced with the task of organizing a course in Preventive Medicine I found no single medical work, or any small number of them, that embraced all that I thought desirable for an inclusive review of the known causes of disease, where they originated, and what they did." It is soon seen that the author uses the term "Disease" in the oldest and widest sense; meaning any alteration of the normal vital processes of the body, under the influence of some unnatural or hurtful condition. His motto is "To oppose or intercept a cause is to prevent or dissipate its effects".

The book is encyclopædic in scope, as is shown by the titles of the six categories of the Causes of Disease, which have been selected. These are (1) Inherited factors; (2) Defects of Nutritive Elements; (3) Exogenous Chemical Agents; (4) Physical Forces and Energies; (5) Vital Activity of Invading Organisms; (6) Psychologic and Bio-social Influences. The volume deals with the effects of fire and frost, feast and famine, fever, flood, and fury. There are proper places in the pages for the thunderbolts of ancient Jove, and the poison gases of modern Mars, along with the effects of barometric pressures and instructions for the prevention of ill effects from the use of radium dial paint. The subjects are as diverse as the nature and effect of gamma rays, septic tank construction, and bedtime stories for children. One finds discussion of matters as old as the sin of Onan and as new as the deaths from an elixir of sulphanilamide.

Naturally, when handling such controversial problems as measures to prevent the transmission of hereditary defects, or the avoidance of alcoholism, Perkins cannot be expected to agree with everyone, but he is never to be found without moderation and equanimity.

It is quite probable that if one had access to a large library he could find most of the facts of the book, but he would sorely miss the selection, editing, and consideration of these facts by a student who has devoted much time and thought to his subject.

The History of Bacteriology. W. Bulloch, M.D., F.R.S. 422 pp., illust. $3.25. McAinsh, Toronto, 1938.

The story of bacteriology's development is told in this book with attention to the relevant and interesting detail but without loss of narrative value. Points which will appeal particularly to teachers and to contributors to medical literature who have need of a ready reference on the subject are that the whole is carefully indexed as to subjects and personal names, it is divided into chapters dealing with clinical aspects of the subject, and 50 pages of short, one-paragraph biographical sketches of all the principal contributors to the subject are included, giving their dates, birthplaces, positions held, and principal work done. This last, a sort of "Who's Who" in the science, alone should establish the book as a standard reference.

Sulfanilamide Therapy of Bacterial Infections. R. R. Mellon, P. Gross and F. B. Cooper. 398 pp. $4.00. C. C. Thomas, 1938.

The literature is so crowded with reports on the new chemotherapy of bacterial infections and the whole subject is in such a state of flux that a book with the

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suggestion of stability about it seems quite unnecessary. Almost before it is printed the problems have changed and new compounds are being used and discussed. A complete review or a critical digest of the work done to within perhaps three months of the date of publication (June 1st) might have been of definite value in saving the time of the busy investigator. In the preface the authors say, "We have endeavoured to include in the bibliography every report in the literature bearing on the subject until the latest time for going to press", but so many important articles from the 1937 literature have been omitted that the review as such is of small value. The references to the work on Gonococcus and Meningococcus are particularly incomplete, the August, 1937, issue of the *Journal of Pædiatrics*—a valuable symposium on the subject—is not mentioned, and the reviewer has noted over sixty significant omissions covering various phases of the subject. The fullest and most interesting part of the book is devoted, with frequent repetition, to work done in their laboratories: on "potentiation" effects in bacteriostasis; the treatment of white rats with experimental pneumococcus pneumonia; and the factor of fitness of the host and natural resistance, but since these have all appeared in medical journals in more compact form they scarcely merit the writing of a book to incorporate them.

The specialist in research will be mildly annoyed by the controversial tone so often adopted, and practitioners will fail to find a clear presentation of the laboratory side of the problems and will be impressed by the incompleteness of the references to the clinical material from the literature. Anyone unfamiliar with the rapid development of this form of therapy might well be impressed by what has happened in a little over two years, but such a book is not needed to make everyone realize that bacterial chemotherapy is tending towards a revolution in medical treatment of infectious diseases.

Pathological Technique. F. B. Mallory, A.M., M.D., S.D. 434 pp., illust., $5.00. McAinsh, Toronto, 1938.

It is with great pleasure that we receive for review this invaluable book on laboratory technique. This book may be considered a replacement of "Pathological Technique" by Mallory and Wright which has long been a standard text and has been out of print for some time.

The book is not an encyclopædia of formulæ, but rather a careful selection of standard formulæ and more recent formulæ thoroughly tested by the author and found to be the best or most promising methods devised for the histological, bacteriological and mycological study of tissues. Besides the histological technique there are chapters on the classification and theories and practice of the staining of tissues and on laboratory equipment, injection methods, post-mortem technique, the preservation and the photographing of gross pathological specimens. In the addenda is a list of standard and useful formulæ of solutions that are required in the pathological laboratory.

The medical student and practitioner would do well to use this book, to become familiar with the proper method of preserving tissues intended for histological study, as so often important specimens are delivered to the laboratory in a deplorable state.

Pathologists and technicians generally owe Dr. Mallory a great debt of gratitude for his sound instructions and his excellent contributions to pathological technique presented in the present volume as well as in previous publications. His inexpensive book gives information and instructions sufficiently complete for the equipping and management of the laboratory of pathology. It is a modern presentation of accepted pathological techniques, retaining the best of the past and adding only the most promising methods of the present. Although there are other excellent books on the subject the long practical experience and the recognized authority of Dr. Mallory make this book indispensable in any pathological laboratory.

William Alanson White—The Autobiography of a Purpose. W. A. White, M.D., A.M., S.D., LL.D. 293 pp. $3.50. Doubleday, Doran, New York, 1938.

Dr. White describes himself "as essentially an introvert, but having had all my life to live the life of an extravert". In contrasting the intravert and extravert types, he thinks of the introvert as "essentially a thinker and not a doer". Notwithstanding this description of his temperament, Dr. White must have had a remarkable capacity for accomplishment. The long list of his published scientific writings, running into hundreds of titles, in itself is evidence of his productivity—and this in a man who at the age of 33 was the superintendent of one of the largest mental hospitals in the United States. Busy as an administrator and writer, he found time to lecture on the staff of universities, to act as adviser to the Federal government of the United States, to examine patients as a consultant in psychiatry, and to keep up an extensive correspondence—no small feat in a man who was "essentially not a doer"!

Most of the volume is an account of conditions in a public mental hospital. The accuracy of this account could be endorsed by any doctor who has spent some time on the staff of such a hospital. The recollections are accurate and vivid. A wealth of experience is garnered here, and many a therapeutic or administrative maxim awaits the professional reader. Treatment of patients, a warning against the deadening influence of classifications, dealing with relatives, the inevitability of criticism: these are of recurring interest to the medical staff of every mental hospital.

One of the most interesting chapters is entitled "Medicolegal Experience". Dr. White recalls some of the court cases in which he testified as an expert. He was a witness in some notable trials, particularly the Thaw case, and the Loeb and Leopold case.

While the volume will have a distinctive interest for the institutional psychiatrist, it will make instructive and entertaining reading for the non-professional reader, who is interested in such timely topics as the causation of mental illness and criminal conduct. It is in no sense a technical work and is written in an easy style, without the use of medical or psychological terms.

British Periodicals of Medicine. W. R. Lefanu, M.A. 93 pp. $1.25. Johns Hopkins Press, Baltimore, 1938.

This will interest very few medical men, because very few are interested in bibliographies. But for the chosen ones it will have the mystical fascination which only they know and can understand! Mr. Lefanu has composed a chronological list of medical periodicals issued in all British lands from the 17th century to the end of the nineteenth. He does not claim that it is exhaustive, but one surmises after looking through his sources that he has left but few crumbs for anyone else to gather up. It is extremely interesting to follow the birth and growth of medical periodical literature, and to note the rise and decline of medical fashions. It hardly needs to be pointed out how essential they are now in the medical world, but one may speculate what developments there may be amongst them in the future. The mortality is high, in spite of the growing demand for publication of new work. But the mortality always has been high, witness the long lists of deceased titles in Mr. Lefanu's list: and it does not include American publications. Those will require a bibliography to themselves.

Guiding Human Misfits. A. Adler, M.D. 88 pp. $1.75. Macmillan, Toronto, 1938.

Based on many years of study and experience in psychotherapy, this book has much in it to appeal to those interested in this subject.